



Research article

Geoethics and dimensions of vulnerability in Central Africa: the case study of the Democratic Republic of the Congo

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Abstract: This article aims to analyse the dimensions of vulnerability in the complex territorial ecosystem of the Democratic Republic of the Congo, considering some substantial geoethical considerations and guidelines, usefull for the resolution of crisis situation. A thematic analysis was carried out on a gathering of secondary data and testimonies. Specifically, the paper will examine the modalities by which the mitigation process of the various vulnerabilities can be realized if implemented in synergy with some geoethical key points. This could contribute to the disaster risk reduction in DRC. Therefore, this paper will ascertain how the promotion of an environmental and ethical responsibility cannot be ignored in the future. It must be recognized that social, physical, environmental, economic, cultural, institutional vulnerabilities are intertwined and interdependent. So, for their resolution, an integrated and multidisciplinary approach and the adoption of strategies shared by all the national and international stakeholders and policy makers are required.

Keywords: conflicts; disaster risk reduction; geoethics; Democratic Republic of the Congo; vulnerabilities

1. Introduction and historical background

The Democratic Republic of the Congo (herein referred to as the DRC) (Figure 1)—formerly Zaire—is the second state of Africa in order of territorial area and one of the richest in terms of natural resources. The historical background is very troubled and complex; the colonization of Congo was one of the most violent and bloody in the whole Africa. In 1874 the English explorer Henry Stanley was instructed by King Leopold of Belgium to discover the basin of the Congo River. This set a precedent

for European domination. A decade later the Conference of Berlin (1884–85) conceded Congo to the Belgian king who established it as a private colony under the name of “The Congo Free State”. It was a wretched domination: ivory and gum alimanted a predatory economy based on a brutal exploitation of the indigenous population. According to estimates of Adam Hochschild [1], King Leopold’s colonization project cost the lives of ten millions of Congolese with the country losing about half its population during the period. In 1908 the colony was placed under the Belgian parliament’s control which inaugurated a less brutal government. Independence was achieved in 1960, but violence and political crises continue to mark the post-colonial history of the country [2]. In fact, the DRC went through thirty-two years of dictatorial regime under General Joseph-Désiré Mobutu, who came to power in 1965. He imposed a one party regime complemented by the cult of his dictator’s personality. Mobutu was overthrown on May 1997 after a six months rebellion leaded by Laurent Désiré Kabila, leader of the political and military movement named *Alliance des forces démocratiques pour la liberation du Congo* (AFDL). Kabila governed the country between 1997 and 2001. During this period, the DRC experienced political instability in addition to the military conflict known as “The Great African War”. The Second War of the Congo lasted until 2002 and involved many African countries, including Angola, Burundi, Ciad, Republic of Namibia, Rwanda, Uganda and Zimbabwe. The cause of the conflict can be summarized by three main points:

1) a lucrative war economy based on the traffic of precious minerals (coltan, gold, diamonds, stream tin, etc.) controlled by the rebel movements in complicity with Rwanda and Uganda [2].

2) Conflict for citizenship between the ethnic groups of the autocton and ruandophone populations (specifically the Banyarwanda in the North Kivu and the Banyamulenge in the South Kivu). This conflict produced a deep political and cultural insecurity that drove many Banyarwanda, and expecially many Banyamulenge to join with rebel movements supported by Rwanda and Uganda [2].

3) A corrupt and incompetent Congolese State that acted more like a predatory machine in contrast to the other African state belligerents, and which benefitted from the instability it created in the country [2].

In January 2001, President Kabila was assassinated in murky circumstances, and was then replaced by his son Joseph Kabila. With the younger Kabila in charge, a global deal on the DRC’s transition (Global and Inclusive Agreement on Transition in the Democratic Republic of the Congo) was signed in Sun City at the close of the 2002 Inter-Congolese Dialogue (ICD). This agreement created transitional institutions and the adoption of a new Constitution, on 18 February 2006. Since then, the DRC has undertaken a long process of reconstruction and stabilization with the support of international institutions. But this process has been constantly hampered by internal political conflicts and the activity of various local and foreign armed groups, assisted by the contiguous countries of Rwanda and Uganda [3,4]. In December 2018 presidential and National Assembly elections were held, after being postponed several times by Kabila, and generating a popular discontent. Felix Tshisekedi, son of Etienne Tshisekedi, opposition leader from the 1980s to his passing in 2017, won the presidential election with 38% of voter preferences. But the election resulted in creating a clear minority in the DRC’s National Assembly. In fact, the new president’s party, Union for Democracy and Social Progress (UDPS), founded by his father in 1982, obtained only 10% of the seats. The majority, 340 out of 500 seats, went to the Common Front for Congo (FCC), ex President John Kabila’s party, who did not run in the election because of the constitutional limit on mandates. Kabila had nominated a protégé to run for president who did not achieve a satisfactory result, coming in third. So, during the delicate phase of waiting between the vote tally

human well-being to be damaged by disruption to individual (mental and physical health) and collective (health, education services, etc.) social systems and their characteristics (e.g. gender, marginalization of social groups)” [8]. The economic dimension concerns the “propensity for loss of economic value from damage to physical assets and/or disruption of productive capacity” [8]. The physical dimension consists in a “potential for damage to physical assets including built-up areas, infrastructure and open spaces” [8]. The environmental dimension concerns the “potential for damage to all ecological and bio-physical systems and their different functions” [8]. The institutional vulnerability involves the “potential for damage to governance systems, organizational form and function as well as guiding formal/legal and informal/customary rules” [8]. The cultural dimension is “the potential for damage to intangible values including meanings placed on artefacts, customs, habitual practices and natural or urban landscapes” [8].

This paper by employing thematic analysis [10], will discuss the dimensions of vulnerability related to the DRC, based on testimonies and secondary data. The former has been collected from international literature, both scientific and grey, but also from websites, social media and newspapers. In addition, the paper examines the ways in which overcoming vulnerabilities, if implemented in synergy with some geoethical key points, could contribute to greater disaster risk reduction in the DRC. Some geoethical key points have already been dealt with in: [3,4,11] and in this article they will be further explored. Geoethics aims to study the ethic, social and cultural implications accompanying a geoscientist’s activity and research [12–14]. It suggests to the world a vision of the relationship between human beings and environment that tries to overcome their framing as binary opposites [15]. In addition, geoethics promotes a cultural awareness of humans as primary agents of environmental action (not just represented by Earth scientists, geoscientists and geographers, but also by ordinary citizens). This could orient agent choices towards a respect of the natural, environmental, ecosystemical dynamics that produce positive enhancement in a territory [16]. The challenges facing the DRC require, therefore, new approaches and a multi-scale integration of systems, interdependent with each other, as will be discussed in the following sections.

3. The thematic analysis

3.1. Environmental vulnerability and geoethical recommendations to face the post-conflict challenges in DRC

The DRC possesses a great abundance of natural resources: fertile land, large rivers and lakes, in addition to dense forests providing fine woods. Subsoil deposits include huge quantity of gold, diamonds and other precious stones, uranium, brass, cobalt, petroleum, and natural gas. Despite these resources, most of the population is very poor and exposed to disasters related to extreme natural events, infectious diseases, and constant political tensions. In fact, the abundance of natural resources also stimulates the risk of armed conflicts [17]. In 1994, the Tutsi genocide in Rwanda was one of the most terrifying and tragic massacres of our time. The genocide produced a mass exodus from Rwanda, that poured into Congo, settling a mass population for many years in refugee camps in the National Park of Virungas, one of the oldest of the great natural parks of sub-Saharan Africa. It was established in 1925, in colonial times, and named Albert Park, in honour of the king of Belgium. It has been a UNESCO World Heritage Site since 1979, and houses one of the most geologically and biodiversity-rich natural environments in the world. Unfortunately, in the 1990s, the forests were

plundered of timber and wild fauna; even mountain gorillas¹, threatened with extinction, were killed for subsistence [3,4]. Political conflict in the DRC contributed to increasing environmental damage. The National Parks of Garamba and Virunga were also directly affected by the activities of armed groups. The number of hippopotamuses dropped from the 30,000 units of only thirty years ago, to less than 1,300 of today. The number of elephants decreased even more significantly: the total population declined from around 62,000 units in 2002 to around 23,000 in 2006 [19]. For example, at the peak of the crisis, it was estimated that the National Park of Virunga was losing the equivalent of 89 hectares of forest every day, due to the illegal gathering of firewood [19]. Unfortunately, the park has suffered invasions and poaching activities that threatened the lives of the rangers: in the last 20 years more than 180 rangers have been killed trying to defend the park against illegal acts. Recently, there have been episodes of violence and new deaths. In order to increase the environmental safety, the DRC government and international stakeholders have implemented a series of initiatives including:

1) The suppression of minerary sites and the protection of national Parks, by carrying out checks through anti-poaching patrols, preventing the illegal wood gathering and promoting the transfer of refugees. These measures have also contributed to encourage the tourism [19,3,4].

2) The reduction of greenhouse gas emissions from deforestation and from degradation of forestal areas.

Considerable progress has been made, but the DRC, in addition, could address environmental post-conflict challenges, by building on significant geoethical recommendations, mainly shared by UNEP [19] and by WWF [20] too listed below:

1) The concrete implementation of a green economy transition, by supporting the best sustainable economic practices and financial investments in development and infrastructure projects.

2) A geoethical model of mining management is required. This could overcome the remarkable passivities and contradictions in a century of mineral extraction by the introduction of a new and modern minerary approach. It would involve a formalization of the artisanal mining sector, and introducing better environmental and health standards [19,3,4,11].

3) The creation of a network of protected areas aimed to preserve biodiversity.

4) Enhancing community resilience, institutional capacity and risk governance for the prevention of the disasters related to epidemics, volcanic eruptions, flood and forest fires, by including early warning systems.

5) The creation of a more detailed mapping of natural resources, integrating the economic evaluation of the ecosystem services inside development plans [3,4,11].

6) A close monitoring of multinational companies activities, with the aim of tracing supply chains of the minerals extracted. In fact, major brands of electronics often don't implement necessary and basic checks to ensure that the cobalt used in their products is extracted in respect of human rights and do not involve exploitation and child labour.

7) The safeguarding of DRC forests, where climate threats, and anthropic impacts will increase drastically [21].

¹ The mountain gorilla is classed by Iucn (International Union for the conservation of nature) as endangered, because its survival is seriously threatened by the progressive reduction of its natural habitat and by the poachers action that dramatically reduced the number of individuals, to about the actual one thousand units [18].

So, it is crucial today, that in order to protect environment, biodiversity and climate stability, to develop policies and funding mechanisms that ensure a future of social justice. This is closely related with the environmental and geoethical responsibility, in the context of the DRC.

3.2. *Social and cultural vulnerability; urgent measures and actions against conflicts, child labour and educative poverty*

In the DRC, according to a report published by Amnesty International and Afreewatch [22], thousands of children are exploited by illegal employment, are forced to work in cobalt mines, digging the earth to extract precious minerals used to fabricate batteries for cell phones, smartphones, PCs, electric cars and other portable electronic devices across the globe. Children are employed in extreme conditions, often without any personal safeguards or respect for their rights, enduring exhausting shifts, and exposure to the weather, working side by side with adults [23]. Children are used to wash and sort minerals before such elements are sold to rich multinational societies, the latter aware of the labour chain they are sourcing [24]. In 2017, the DRC promoted a national strategy to eradicate by 2025 the worst forms of child labour. The plan aims to strengthen the Ministry of Employment so that it can apportion more inspectors and guarantee free and compulsory education for all children under 16, and institute a national minimum age for employment. However, this strategy has yet to be implemented by the government, despite the recommendations of supervisory bodies of the ILO (International Labour Organization), that considers the adoption and financing of the plan as a matter of utmost urgency [25]. In fact, with the Goal 8.7 of the United Nations Sustainable Development Agenda 2030, all countries have pledged to take immediate measures to eradicate the worst forms of child labour by 2025 [26].

Many young people and children, in addition, are driven to enlist in armed groups (Figure 2), which are active in the eastern regions of DRC. Behind this phenomenon, according to the anthropologist Jourdan [27], there is the influence of socio-cultural and structural factors. In the analysis of the causes of civil conflicts, as evidenced by Jourdan [27], some researchers argue that a demographic structure characterized by a high percentage of young people—in particular young unemployed males with a low education level—represents a risk factor of war [28]. According to Jourdan, “it is evident that the lack of job opportunities, in contexts of widespread violence, may be an impulse to enlistment because, in the absence of alternatives, the membership in a militia tends to become an opportunity of social mobility” [27]. However, in the North Kivu region, among the structural factors that encourage enlistment, the land question seems to play a central role [29]. In Congo, massive recruitment is the result of a widespread opportunism which may be related to socio-cultural factors—what the Canadian historian, Bougmil Jewsiewicki, called *mobudist habitus*. Likewise Jourdan [27] underlines in the wake of Pierre Bourdieu’s sociological theory [30], *mobudist habitus* outlines a number of mental and behavioral dispositions structured during the decades of the Mobutu’s kleptocratic dictatorship, which led individuals to act on the basis of personal gain, the violent symbolic definition of the “other” and the fear of becoming in turn a victim of violence [31]. According with Marone [24], for girls the situation is doubly difficult: bearing most of the burden of domestic work, girls are less educated, and experience slavery, torture and rape, often becoming infected by HIV as a result. In addition to fighting, militarized girls must keep fields clean, uniforms in order, prepare meals and satisfy the sexual appetites of the soldiers [32]. Laura

Guercio, Representative of the Coordinating Committee of Universities Network for Children in Armed Conflict, interviewed by Guderzo [33] displays alarm over the vulnerability of these girls:

“All these violations affect children in the same way, but should be taken into account the highest vulnerability of girls. For too long has been denied their involvement in the phenomenon of child soldiers and that has excluded them from the disarmament and reintegration processes inside of which boys have been instead considered. Social reintegration is more delicate for girls, especially in patriarchal societies where there are social stigmas that induce to see a violated woman not as a victim but very often as a dirty person, no more socially fit to be part of society. So, girls, former victims of abuses perpetrated during the conflicts, undergo a social stigmatization that leads them to be excluded from the departure community. That’s why is needed a particular attention and sensibilization in relation to the issues that concern them” [33].

DRC has made remarkable progresses in regards to the completion of the cycle of primary education [24]. However, according to UNICEF reports, in the DRC nearly 7 million of children aged from 5 to 17 years do not attend school. The difficult economic situation caused by decrease in raw material costs, the political frailty arising from social crisis and other disasters related to extreme natural events did not allow the DRC to achieve universal primary education. According to UNICEF [34] (2021a), this situation is aggravated by the non-application of the school’s free-of-charge provision decreed by the government. The majority of direct and indirect expenditure on children schooling is charged to parents, including running costs of the school and awards to teachers who are not in the official system or are paid late [34]. Besides these economic disparities, there is an unequal distribution of scholastic infrastructures, socio-cultural barriers and other vulnerabilities like child labour and marriage, early pregnancy and disability. In the country 52% of girls aged from 5 to 17 do not attend school. In terms of education quality and internal efficiency, the results of the analysis of students performances show high repetition and dropout rates [34]. The low rate of qualified teachers, their unequal distribution, the inadequate infrastructures and anachronistic teaching materials don’t support the promotion of quality education.

Significant action and measures are, therefore, needed from governance and international bodies to reduce educative poverty in the DRC, moreover exacerbated by pandemic. In fact, in the face of virus spread, the government has been unable to insure proper delivery of health services to the most vulnerable people, including children, who do not receive basic medical care, including vaccinations. Schools have been closed and as places of protection and not only of education, this has exposed children to recruitment by armed groups. For girls school is an even more important opportunity because of their risks of being abused in the fields, recruited by militias, or forced to look for other ways to survive [24].



Figure 2. Child soldiers in DRC. Source: Luca Jourdan.

3.3. Social vulnerability. Beyond Covid-19: sanitary emergencies in DRC

The DRC is gripped by two major epidemics of Measles and Ebola that have caused thousands of deaths in the last two years, in addition to outbreaks of cholera and poliomyelitis. In the eastern provinces (North and South Kivu, Ituri), as evidenced by Oddi [5], the diffusion of Ebola was also facilitated by the attacks of several local armed groups against Congolese health professionals of the Ministry of Health, the Red Cross, Doctors Without Borders and the World Health Organisation (WHO). Military personnel of the Democratic Republic of the Congo Armed Forces (FADRC), the blue helmets of the UN peacekeeping operation MONUSCO (United Nations Organization Stabilization Mission in the Democratic Republic of the Congo) were also attacked. Among irregular militias, often reputed to be financed by Uganda, Rwanda and Burundi, the Allied Democratic Forces (ADF), an armed group that in the last five years has shown the first symptoms of Jihadist radicalism, stands out with their attacks announced through the media arm of the Islamic State [5].

Ebola officially appeared in the DRC on 1 August 2018 and the WHO immediately classified it as an international sanitary emergency [35]. As underlined by the anthropologist Giovanni Gugg [35],

in just over two and a half year there were about 3,500 confirmed infections, with 2,270 fatalities and 1,200 survivors. Two-thirds of infections have been in women and the reasons are mainly two: on one side many men in the area are involved in the fights that persist for decades and, living in clandestinity, probably, according to the NGOs operating on site, when they get sick it doesn't get out; on the other side, as also evidenced by Gugg [35], in the area plagued by infection in recent years, women run the house, that is they take care of children and of the sick family members, so the others are reluctant to send them to treatment centers, with the risk that disease gets worse and virus infects new patients. For this reason, efforts have long been focused on informing the female population about the risks of Ebola [35]. On Monday 3 May 2021, the Congolese Minister of Health, Jean Jacques Mbugani, finally declared the end of the Ebola epidemic in the province of the North Kivu, at the east of the country (Figure 1).

One of most recent cholera epidemics was declared in January 2019 in the province of Haut Katanga (Figure 1), but affected 22 provinces are with 30,129 registered cases and 513 deaths (data updated to 2020). Measles affected 310,000 people in 2019, especially children, causing the death of at least 6,000 people, despite the vaccination of 18 million babies under 5 years that, however, is not yet enough to cover the entire population [35]. Polio, in the end, was found in 84 cases, in particular in the provinces of Kasai, Kwango and Sankuru (Figure 1), but the last year a case was found also in the capital Kinshasa. That is of particular concern because it is a megalopolis of 15 million inhabitants [35].

As regards the spread of Covid-19, the daily number of tests carried out in the whole territory is very limited (about 1,500 a day). Available data on vaccinations, provided on 10 July 2021, indicate a cumulative amount of 72,748 people already vaccinated in DRC with the first dose of AstraZeneca-Vaxzevria—from 19 april 2021—among which 1,944 people vaccinated with the second dose [36], on a population of 92 million inhabitants (recorded at the registry office). Numbers are very low when compared to the ones of European countries, such as, for example, Italy, that on 23 July 2021 counts 29 million of vaccinated people with both the doses on a population of 60 million inhabitants. To solve the pandemic crisis it is, therefore, necessary to vaccinate the whole mondial population, that means enhancing vaccination campaigns in the African countries. In fact, this being a global crisis, nobody will be safe until we are all safe. And the developed countries won't come back to life like before, if they leave behind the less developed ones. It is, therefore, necessary to invest in the sustainable empowerment of the sanitary systems and of human resources for health, as of the sanitary research and development in African countries. Many countries in sub-saharian Africa have vulnerable sanitary systems, that have been made further fragile by the impact of pandemic. Besides, they suffer a serious loss of healthcare professionals on the front line, exacerbated by the spread of Covid-19.

3.4. Physical and economic vulnerability: risks related to extreme natural events

Many communities in the east of DRC live nearby volcanoes and often face natural hazards like earthquakes and volcanic eruptions. Virunga mountains are a volcanic chain of eastern Africa, along the northern border of Rwanda, DRC and Uganda. This mountain chain is a branch of the Albertine Rift, part of the Great Rift Valley. These mountains are located between Edward Lake and Kivu Lake. The chain includes eight major volcanoes: the eastern group that includes Muhavura, Gahinga and Sabinyo volcanoes, the central one constituted by Visoke, Karisimbi and Mikeno volcanoes, and then the western group prevalently constituted by active volcanoes, namely Nyiragongo (Figure 3),

that culminates at 3,462 meters above sea level and Nyamuragira (Figure 3), that culminates a 3,063 meters above sea level, located internally in DRC [37–40].

Around 07:00 p.m. on Saturday, May 22, 2021, the volcano entered into activity, causing 32 deaths and thousands of displaced people in Goma, important city of the eastern DRC, capital of the North Kivu province, on the border of Rwanda. The last volcano's eruption dates back to 2002. It caused the destruction of a part of Goma city, the death of 250 people and the displacement of 120,000 inhabitants because of the lava flow. Gugg evidences:

“Goma is a nevralgic city for the region, extremely frail on a geophysical level, but also for being the only center to offer some protection from violence and misery to which the countryside is exposed. That determined its strong demographic growth in the recent years e the resulting urban and social fragility: Goma was the center of last decades wars in Kivu and at least two times it was assaulted by marauders who raided it. So, the city is extremely vulnerable on various levels, as also unfortunately shown by the murders of the Italian Ambassador Luca Attanasio last February, of the Military Police Officer Vittorio Iacovacci, and of the driver Mustapha Milambo” [41].

The UNHCR, ONU Agency for the Refugees, is doing a huge job for the hospitality and assistance of thousands people affected by the eruption. Are about 450,000 the people flee from Goma, of which 120,000 have come to the neighboring city of Sake (Figure 3), in the eastern province of the North Kivu. Many people, forced to leave their homes, have been hosted by local families or arranged in schools or churches, with urgent necessity of an accommodation, of water and food. Many houses have been destroyed by lava flow, and many people had to leave the city following the evacuation order for the eight Goma's areas more at risk in the event of a new eruption. In the reception areas it's also needed an assistance based on the emergency psychology [42,43], as requested by the regional hospital's doctors, where many people show signs of traumatic disorders. Another very serious aspect of the emergency in Goma is brought to light by UNICEF, that reported the dramatic condition of hundreds of children left alone or missing [44].

As underlined by Habakaramo et al. [39] the disadvantages of volcanism are several for the community of DRC:

- Death of human beings, wild animals, and destruction of plants during the periods of hight activity;
- Transformation of arable land into volcanic rocks; that lead to poverty, famine and scarcity of land for the local population;
- Greater spread of diseases within the community;
- Environmental pollution;
- Destruction of infrastructures like houses and indirect economic losses.

Besides the volcanic and seismic risk, the DRC is also is subject to climate risk, flood and drought. Between November 2015 and September 2016 climatic adversity attributed to the El Niño phenomenon produced flood and drought that affected more than 770,000 people in 13 of the 26 provinces of the country. That caused about 90 deaths and many other damages, expecially along the river Congo, and the displacement of over 106,000 congolese [45,46].

Territorial vulnerabilities contribute to transform in disasters situations already severely compromised, expecially in the areas in which the public services, already scarce before, now are completely abstent. For example, the water and electricity furniture, and in addition the Covid-19 emergency and the hight tensions already present in the territory. Surely, in the case of the Nyiragongo volcano's eruption, a mismanagement of the Goma's Volcanological Observatory (OVG) on risk communication and prevention affected the impact of the extreme natural event, that

turned into a disaster. Would be needed a proper management of funds and a better preparation of researchers. They must be equipped of all the instruments and resources, structural, cultural and economics, to be able to prevent a disaster. A geoethical approach, in this direction, can provide us with the correct categories to discuss about prevention, involving scientists, political classes, international organizations and citizenship, and calling them to their own responsibilities.

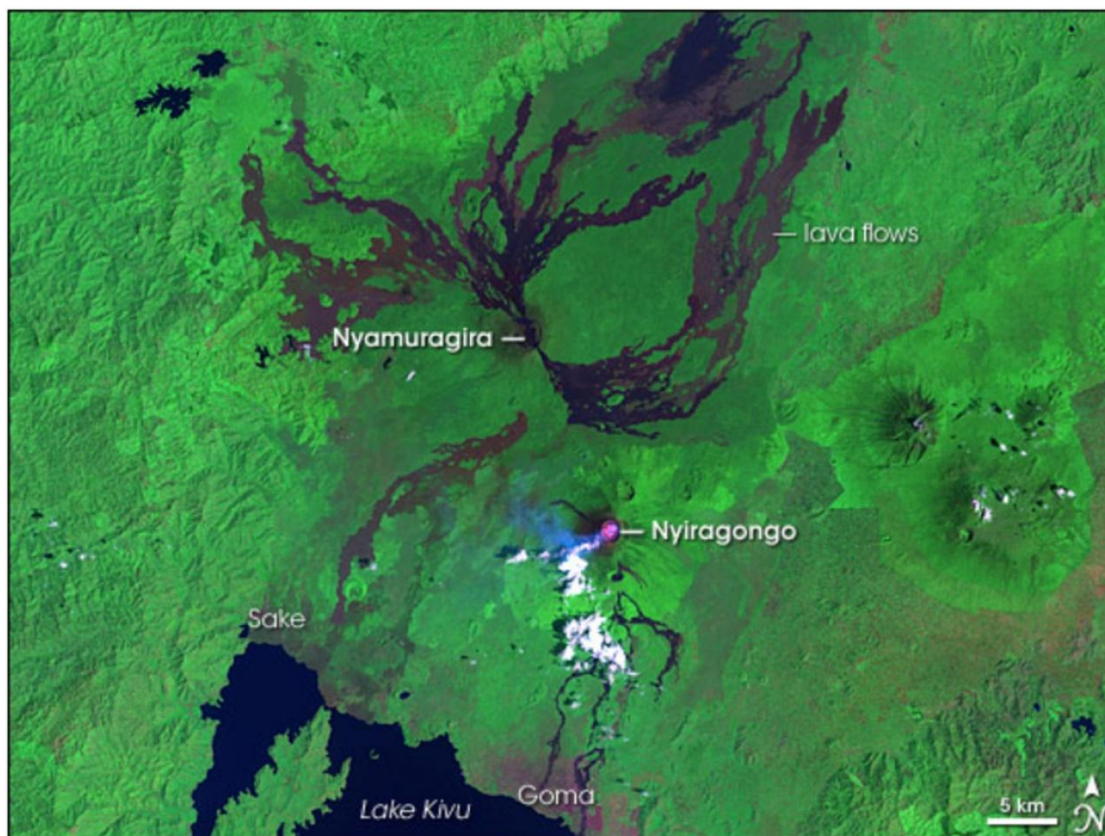


Figure 3. Image of Nyamuragira and Nyiragongo volcanoes on January 31, 2007, about a year after Nyiragongo sent a devastating lava flow through the town of Goma. Source: NASA image created by Jesse Allen, using Landsat data provided by the University of Maryland’s Global Land Cover Facility [47].

3.5. Institutional vulnerability: the recent political crisis in the DRC

Where political institutions fail it triggers a process of “non-recognition”. In fact, what has happened and continues to happen in Congo is nothing but a symptom of political institutions vulnerability. Institutions that, according to Dattilo [48], “are no longer able to fix the original performative force of the anthropogenetic experience, producing a disconnect between citizens and public sphere and so rejecting the majority of human beings in the space of the vocal noise, reducing the living to a purely biological reality where only sufferings find echo”. According again to Dattilo [48], “mutual recognition is not so much the border characterizing history, it is rather a specific linguistic phenomenon, where can be glimpsed the weakness of institutions, in this case, policies”. The DRC, as we saw at the beginning of this article, has always been a country characterized by violent conflicts, at the base of which there is the evident political instability, several governance deviations and the crisis of institutions; the country, also recently, went through a

deep political crisis. The country's Constitution, in fact, previews a maximum limit of two presidential mandates. Joseph Kabila, who had carried them both out, didn't seem intent on leaving power. The elections to be held in 2016, were postponed several times, a fact that produced a deep popular discontent. Consequently, in the main cities of the country took place several demonstrations, brutally repressed by the security forces of the regime [49]. Besides, as of 2016, in the province of Kasai a bloody conflict exploded: a traditional local leader, Jean-Pierre Mpandi, gave birth to a rebellion against central government and the intervention of national army caused many deaths, mostly civilians [49]. Kabila didn't miss a chance to extend beyond the time limits provided his permanence in power, by appealing to the situation of instability in the North Kivu region and to the outbreak of a new ebola epidemic. The Church, especially the figure of Cardinal Monsengu, deceased on 11 July 2021, whose frankness and freedom of speech was known, did not hesitate to play a leading political role in that difficult situation. In the end, the Electoral Commission managed to set the election date to 23 December 2018. Nevertheless, a general impreparation to vote, electoral lists not yet completed and an accident in which over 8,000 machineries for electronic vote were destroyed, made the elections newly postponed to 30 December 2018. Felix Tshisekedi, leader of the Union for Democracy and Social Progress (UDSP) party, was sworn in as President on January 24, 2019, after winning the elections. So, he substituted Joseph Kabila, leader of the People's Party for Reconstruction and Democracy (PPRD). It is suspected that Tshisekedi's victory is the result of an agreement with Kabila to ensure that the latter can still influence the domestic policy in the DRC. Surely, for Tshisekedi it will not be easy to face the decades-long influence of Kabila and his party. Tshisekedi should also represent an active partner in the process of national pacification and reconstruction; besides, he should face the structural problems that have long afflicted the country and try to overcome the institutional vulnerability enhanced in the past 19 years of power by the political team of Kabila, not able to manage peace, justice, human development, security and democracy [50].

4. Discussion and conclusions

That of the DRC presents one of the most complex and violent crisis ridden regions in the contemporary world. To identify some solutions to this crisis, therefore, it is necessary to adopt an interdisciplinary and holistic approach, by examining all the present dimensions of vulnerability. They are intertwined and request an overview in order to understand their meaning. This contribution's purpose was to analyse these dimensions to try to trace a path of awareness-action, without claiming to be exhaustive, starting from the consciousness of the territorial limits and fragilities. DRC, in fact, is one of the richest countries in the world in terms of mining of gold, diamond, and important minerals in the field of electronics, like coltan. It is even rich in terms of biodiversity of flora and fauna. However, it is also one of the most troubled and poor countries. This is a fact that should not be surprising because, where there is wealth, inevitably, prevail the interests of a few actors that, unfortunately, do not coincide with the population and territory ones [3].

So, the peace process in Congo represents a unique opportunity to support an authentic development, in one the poorest countries in the world, and at the same time to safeguard the environment and global climate. Concurrently, it is necessary to apply policies respectful of environment, healthcare, human rights and resources. And it is necessary to overcome the social, cultural, environmental, institutional, economic and physical vulnerabilities – for which politicians, scholars should fight on the front line with the organizations of civil European society, together with

all the countries of the world, the international stakeholders and the NGOs. Only then will it be possible to achieve a geoethical disaster risk reduction model in the DRC. In the Encyclical Letter *Laudato Si'* [51], Pope Francis suggests an approach of “integral ecology,” in order to identify possible directions for the environmental crisis overcome and at once the disaster risk reduction. This represents a proper guidance to solve problems, trying then to go beyond rigid disciplinary boundaries. In fact, Pope Francis calls for an integrated debate on issues relating to environment, economy, politics and society. The Pope recommends transcending the categories of science and biology, to directly draw on the essence of human beings and their inner relations with Creation [3]. Pope Francis reaffirmed in the Encyclical that the natural environment isn't separated from the human one, but is the foundation for the lives of future generations [51]. By these words, the Pope has proven to be the most popular representative in the world of geoethics, an emerging discipline that aims mainly to focus the attention on the enhancement and safeguard of the geosphere and on risk prevention, commencing with interactions between human beings and the environment, from the perspectives of social and environmental justice.

Policy makers and stakeholders should implement programs and actions [52] to avoid the creation of disaster risk (not just reduction). Lewis and Kelman [53] identified seven examples of on-the-ground realities of long-term vulnerability within two clusters: (i) endangerment, which includes (1) environmental degradation, (2) discrimination and (3) displacement; and (ii) impoverishment, including (4) self-seeking public expenditure, (5) denial of access to resources, (6) corruption and (7) siphoning of public money. This scenario, representing the situation in the DRC, highlights the close link among social, economic, ethical and environmental vulnerability with the institutional one, which, together, lead to the creation of a disaster.

Some initiatives focusing on climate, environment and adaptation issues have been promoted in recent years. In January 2021, relevant stakeholders in the country validated their first National Adaptation Plan during a virtual workshop. This strategic document was the final deliverable of the Readiness Program ‘Planning for medium-term investment for adaptation in climate-sensitive sectors in the Democratic Republic of Congo: advancing the National Adaptation Plan (NAP)’ (2018–2020) funded by the Green Climate Fund (GCF) in collaboration with the NAP Global Support Program (NAP GSP) [54].

However, a consistent and long-term educational program on the disaster risk reduction should be embedded in education policies and curricula to ensure that the population becomes well-informed and knows what steps must be taken to reduce risk. A similar initiative was conducted in 2014 by the Ministry of Primary, Secondary and Professional Education (EPSP), but the government needs to invest more in risk reduction education, support for researchers, using resources and tools to mitigate risks present in the DRC territory. In addition to following the geoethical recommendations already illustrated, long-term investment programs in a free and compulsory education for all children, need to be organized to reduce educative poverty and prevent child labour and forced recruitment. Finally, it is necessary to invest in the strengthening of the DRC sanitary systems to prevent and fight epidemics and increase vaccination against COVID-19. The global, in fact, derives from the set of relationships and actions that have their origin in localized behaviors [55]. Similarly, what happens at the global scale interacts with the lower scales. Therefore, if international policy makers and stakeholders fail to resolve locally the health crisis (which is intertwined, as we have seen, with other dimensions of vulnerability and ethical questions) in Central Africa, and specifically in the DRC, it will be difficult and unlikely that the crisis can be resolved definitively on a global scale.

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Conflict of interest

The author declares no conflicts of interest in this paper.

References

1. Hochschild A (2001) *Gli spettri del Congo. Re Leopoldo II del Belgio e l'olocausto dimenticato*, Milano, Rizzoli.
2. De Pascale F, Jourdan L, Kalenge NC (2018) Introduzione. *La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 10–17.
3. De Pascale F, Kalenge NC, Bernardo M (2018) Affrontare la sfida geoetica sulla sicurezza ambientale in aree post-conflitto: il caso-studio della Repubblica Democratica del Congo. *La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 113–128.
4. De Pascale F, Kalenge NC (2017) The geoethical emergency on personal and environmental security in post-conflict areas: the case study of the Democratic Republic of Congo. Firenze: Società di Studi Geografici, *Memorie Geografiche*, 755–762.
5. Oddi E, La Repubblica Democratica del Congo ad un anno dalle elezioni presidenziali, 2020. Available from: <https://www.cesi-italia.org/articoli/1072/la-repubblica-democratica-del-congo-ad-un-anno-dalle-elezioni-presidenziali>.
6. International Rescue Committee (IRC) (2008) *Mortality in the Democratic Republic of Congo: An ongoing crisis*, New York: IRC.
7. United Nations, Cartographic Section. Available from: <https://www.un.org/Depts/Cartographic/map/profile/drcongo.pdf>.
8. Birkmann J, Cardona OD, Carreno ML, et al. (2013) Framing vulnerability, risk and societal responses: the MOVE framework. *Nat Hazards* 67: 193–211.
9. Birkmann J, Kienberger S, Alexander DE (2014) *Assessment of Vulnerability to Natural Hazards. A European Perspective*, San Diego, CA: Elsevier.
10. Braun V, Clarke V (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology* 3: 77–101.
11. Kalenge NC, Bernardo M, De Pascale F (2018) Facing personal and environmental security challenges in post-conflict settings: The case-study of the Democratic Republic of the Congo. *Sostenibilità e responsabilità dello sviluppo. Approfondimenti geografici*, Roma: Aracne, 19–35.
12. Di Capua G, Bobrowsky PT, Kieffer SW, et al. (2021) *Geoethics: Status and Future Perspectives*, London: Geological Society, Special Publications, 8.

13. Peppoloni S, Di Capua G, Bobrowsky P, et al. (2017) Geoethics at the heart of all geoscience. *Ann Geophys* 60: 7.
14. Bohle M (2019) *Exploring Geoethics. Ethical Implications, Societal Contexts, and Professional Obligations of the Geosciences*, Cham: Palgrave Pivot.
15. De Pascale F, V Dattilo (2021) The Geoethical Semiosis of the Anthropocene: The Peircean Triad for a Reconceptualization of the Relationship between Human Beings and Environment. *Ann Am Assoc Geogr* 11: 647–654.
16. Marone E, Bohle M (2020) Geoethics for Nudging Human Practices in Times of Pandemics. *Sustainability* 12: 7271.
17. De Ridder M, Ericsson M, Usanov A, et al. (2013) *Coltan, Congo and Conflict: Polinares Case Study*, Hague, The Hague Centre for Strategic Studies, HCSS Report.
18. Bandarin F, Il Parco dei Virunga nella Repubblica Democratica del Congo. *Il Giornale dell'Arte*, 2020. Available from: <https://www.ilgiornaledellarte.com/articoli/il-parco-dei-virunga-nella-repubblica-democratica-del-congo-/133591.html>.
19. United Nations Environment Programme (UNEP) (2011) *The Democratic Republic of the Congo Post-Conflict Environmental Assessment: Synthesis for Policy Makers*, Kenya: UNEP.
20. WWF, Bacino del Congo, 2021. Available from: <https://www.wwf.it/dove-interveniamo/il-nostro-lavoro-nel-mondo/bacino-del-congo/>.
21. R   ou-M   chain M, Mortier F, Bastin JF, et al. (2021) Unveiling African rainforest composition and vulnerability to global change. *Nature* 593: 90–94.
22. Amnesty International, Afrewatch (2016) *This is what we die for: Human rights abuses in the Democratic Republic of the Congo power the global trade in cobalt*, London. Available from: <https://www.amnesty.org/en/documents/afr62/3183/2016/en/>.
23. UNICEF (2013) *To school, not to the mines: Investing in primary education in the Democratic Republic of the Congo*. Available from: www.UNICEF.org/education/drcongo_68298.html.
24. Marone F (2018) *Con gli occhi dei bambini. Infanzia e diritti. La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 176–194.
25. International Labour Office Conference, 104th Session (2015) *Report of the Committee of Experts on the Application of Conventions and Recommendations*, Geneva: ILO.
26. UN (2015) *The 2030 Agenda for Sustainable Development: the 17 Goals*. Available from: <https://sdgs.un.org/goals>.
27. Jourdan L (2018) *Marginalit   giovanile e proliferazione delle milizie. Rappresentazioni e riproduzione della violenza nel Nord Kivu? La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 99–112.
28. Berdal M, Malone DM (2000) *Greed and Grievance. Economic Agendas in Civil Wars*, Boulder-London: Rienner Publishers.
29. Van Acker F, Vlassenroot K (2000) *Youth and conflict in Kivu: 'Komona clair'.* *The Journal of Humanitarian Assistance*. Available from: <http://www.jha.ac/greatlakes/b004.htm>.
30. Bourdieu P (2013) *Cose dette. Verso una sociologia riflessiva*, Napoli-Salerno: Orthotes Editrice.
31. Jewsiewicki B (1998) *Les traumatismes des affirmations identitaires, ou la mal   diction de ne   tre rien.* *Cah d'   tudes Africaines* 38: 627–638.

32. Human Rights Watch (2002) *The War Within the War: Sexual Violence against Women and Girls in Eastern Congo*, U.S.: Library of Congress.
33. Guderzo G (2021) L'inferno dei bambini soldato in Africa. *Africa Rivista*. Available from: <https://www.africarivista.it/linferno-dei-bambini-soldato-in-africa/188497/>
34. UNICEF (2021) Programme Education. Every child has the right to go to school and learn. Available from: <https://www.UNICEF.org/drcongo/en/what-we-do/education>.
35. Gugg G (2021) RDC: il governo dichiara la fine dell'epidemia di Ebola nel Nord Kivu. *Africa Rivista*. Available from: <https://www.focusonafrika.info/rdc-il-governo-dichiara-la-fine-dellepidemia-di-ebola-nel-nord-kivu/>
36. OCHA Services, Reliefweb (2021) COVID-19 RDC-12 juillet 2021. Available from: <https://reliefweb.int/report/democratic-republic-congo/covid-19-rdc-12-juillet-2021>.
37. Hamaguchi H, Zana N (1983) Introduction to Volcanoes Nyiragongo and Nyamuragira. In: Hamaguchi H, Ed., *Volcanoes Nyiragongo and Nyamuragira: Geophysical Aspects*, Sendai, Japan: Tohoku University, Faculty of Science, 1–6.
38. Hamaguchi H, Zana N (1990) A great circle distribution of four active hotspots: evidence for deep mantle plumes. *Tohoku Geophy J* 33: 3–4, 251–262.
39. Habakaramo P, Mutalegwa G, Kahuranyi J, et al. (2019) *Les Volcans des Virunga à l'Est de la République Démocratique du Congo, une perception populaire: un mythe ou une réalité ?*. In: Gugg G, Dall'O' E, Borriello D, Eds, *Disasters in popular cultures*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 102–117.
40. Rusangiza BK, Mavonga T, Subira MJ (2017) Analysis of earthquakes swarm and volcanic tremor associated with sismo-volcanic activity at volcano Nyamulagira, Virunga region. *Geo Eco Trop* 41: 219–232.
41. Gugg G (2021) RD Congo, Goma in allarme per l'eruzione del vulcano Nyiragongo. *Africa Rivista*. Available from: <https://www.focusonafrika.info/rd-congo-goma-in-allarme-per-leruzione-del-vulcano-nyiragongo/>.
42. De Felice F, Colaninno C (2003) *Psicologia dell'Emergenza*, Milano: FrancoAngeli.
43. Barbato R, Puliatti M, Micucci M (2006) *Psicologia dell'Emergenza. Manuale di intervento sulle crisi da eventi catastrofici*, Roma: Edup.
44. UNICEF (2021) Repubblica Democratica del Congo: l'eruzione del vulcano a Goma costringe alla fuga decine di migliaia di famiglie. Available from: <https://www.UNICEF.it/media/repubblica-democratica-congo-eruzione-goma-fuga-decine-di-migliaia-di-famiglie/>.
45. OCHA-RDC (2017) Aperçu des besoins humanitaires. Available from: http://earlyrecovery.global/sites/default/files/drc_hno_2017_1.pdf.
46. Kalenge NC, Lupia Palmieri A (2018) Analisi degli impatti degli spostamenti interni forzati sulle Capacità (Capability) degli sfollati congolese. In: De Pascale F, Jourdan L, Kalenge NC, Eds, *La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 84–98.
47. NASA Earth Observatory, Images. Available from: <https://earthobservatory.nasa.gov/images/8291/nyamuragira-and-nyiragongo>.

48. Dattilo V (2018) La questione del mancato riconoscimento durante le guerre della Repubblica Democratica del Congo. In: De Pascale F, Jourdan L, Kalenge NC, Eds, *La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, Lago, 50–66.
49. Jourdan L, Kalenge NC, De Pascale F (2018) Conclusioni: dove va il Congo?. In: De Pascale F, Jourdan L, Kalenge NC, Eds, *La Repubblica Democratica del Congo: conflitti e problematiche socio-territoriali*, Lago: Il Sileno Edizioni, Geographies of the Anthropocene book series, 212–216.
50. Rognoni MS (2021) Repubblica Democratica del Congo: sessant'anni di instabilità. *Istituto per gli Studi di Politica Internazionale*. Available from: <https://www.ispionline.it/it/pubblicazione/repubblica-democratica-del-congo-sessantanni-di-instabilita-29416>.
51. Pope Francis (2015) *Lettera Enciclica sulla cura della casa comune - Laudato si'*, Città del Vaticano: Libreria Editrice Vaticana.
52. Luger FR, Farabollini P (2018) Discovering the Landscape by Cycling: A Geo-Touristic Experience through Italian Badlands. *Geosciences* 8: 291.
53. Lewis J, Kelman I (2012) The Good, The Bad and The Ugly: Disaster Risk Reduction (DRR) Versus Disaster Risk Creation (DRC). *PLoS Curr* 21.
54. Le Pivain T (2021) DRC makes strides in adaptation planning and validates a first National Adaptation Plan. *PreventionWeb*. Available from: <https://www.preventionweb.net/news/drc-makes-strides-adaptation-planning-and-validates-first-national-adaptation-plan>.
55. Greiner AL, Dematteis G, Lanza C (2016) *Geografia umana. Un approccio visuale (seconda edizione)*, Novara: De Agostini Scuola.



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