



Research

# The Great Green Wall in Senegal: questioning the idea of acceleration through the conflicting temporalities of politics and nature among the Sahelian populations

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**ABSTRACT.** In January 2021, the Great Green Wall Accelerator was announced at the third One Planet Summit in Paris. Based on the notion of acceleration developed by Harmut Rosa and using the idea of conflicting temporalities in the study of social-ecological systems, this article analyzes how the political will to accelerate the Great Green Wall reveals power dynamics between Western and Sahelian countries. We put in tension this acceleration of the Great Green Wall with (1) temporalities with respect to nature and reforestation, and (2) temporalities of life among the Sahelian populations. Whereas our contribution is mostly theoretical, building on Hartmut Rosa's work, we illustrate our approach in terms of political ecology and anthropology based on an empirical case study of the Ferlo region in Senegal, a key region with respect to the Great Green Wall initiative. Our analysis shows that by controlling the temporality of the Great Green Wall program through this Accelerator, Western powers dominate the Sahelian states, making the Accelerator part of a neo-colonial approach. Moreover, the desire to accelerate the Great Green Wall with a massive investment in a short span of time corresponds to the perception of a nature made available, incompatible with the time of ecological restoration. Finally, the acceleration advocated by Western economic liberalism seems to be coming up against resistance of local populations rooted in an identity that values community solidarity, the stability of social structures, and closeness between humans, their herds, and nature.

**Key Words:** *Africa; environmental humanities; Green project; interdisciplinarity; political ecology; social-ecological systems*

## INTRODUCTION

The Great Green Wall (GGW) is a pan-African ecological restoration and local development program in the Sahel, implemented in 2008. In January 2021, the “GGW Accelerator” was announced at the third One Planet Summit in Paris, with the aim of “responding to the urgency of sustaining GGW efforts... and moving faster.”<sup>[1]</sup> This article unpacks this notion of acceleration as symptomatic of Western post-modernity and analyzes it in parallel with conflicting temporalities of social-ecological systems, namely (1) temporalities with respect to nature and reforestation, and (2) temporalities of life among the Sahelian populations. Conceptually, we will anchor our analysis in relation to Rosa's understanding of acceleration in terms of technical progress, social structures, and the rhythm of life as a symptom of post-modernity (Rosa 2013).

The idea of conflicting temporalities is a subject of renewed interest in the study of social-ecological systems (see de Vries 2019, Fonseca-Cepeda et al. 2019, Voinot-Baron 2020). Our article, which takes the GGW program in sub-Saharan Africa as our key social-ecological system, focuses empirically on its development in Senegal and uses the idea of conflicting temporalities to engage with the notion of acceleration. This notion has not been frequently applied in social-ecological systems (see, for instance, Gotham and Campanella 2011, Hileman and Lubell 2018) and those applying it have not used it as a conceptual entry point so much as a descriptive fact of the acceleration of environmental degradation.

This article follows a political ecology approach (e.g., Robbins 2004, Benjaminsen and Svarstad 2009), dealing jointly with power relations (e.g., Watts 1983), political narratives (e.g., Roe 1994) and public policies (e.g., Blaikie and Muldsavin 2004) in the environmental field. Using data from the natural sciences, particularly with regard to climate change and ecological restoration (Blaikie 1999, 2001), this paper is also rooted in critical realism (Proctor 1998).

After a brief description of the issues related to climate change in the Sahel and a reminder of the initial GGW program, the first part of this article is dedicated to an analysis of the Accelerator, with particular emphasis on the power relations between countries of the North and South in the context of climate change. The second part focuses on the tension between the temporality of the policy, ecological restoration, and the Sahelian populations.

## ANALYTICAL APPROACH

This article is first and foremost a theoretical analysis of the links between politics, ecology, and populations in the era of climate change. It engages with the key debates around the structural causes of desertification in the Sahel, and then situates the GGW initiative in these debates. The GGW and its Accelerator are seen as paradigmatic examples of North-South power relations and different, if not conflicting, relationships to nature between the fields of politics, ecology, and anthropology. As our approach is theoretically rooted in a political ecology (e.g., Svarstad and Benjaminsen 2017, Benjaminsen and Hiernaux 2019), it favors an

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interdisciplinary analysis, combining ongoing research and studies on climate change, restoration ecology, environmental policy, and anthropology of the Sahelian populations. Time, as analyzed by Rosa (2013), constitutes the common lens through which these studies can be brought together.

Building conceptually on the idea of acceleration and different, conflicting temporalities, the article is based on an interdisciplinary dialogue in the Ferlo region in Senegal between anthropologists, political ecologists, ecologists, and natural resources managers (most notably, water and forest managers). This dialogue happened specifically in the rural community of Tésékéré, where a large majority of the authors have been working since 2010 within the framework of an International Human-Environment Observatory (<https://ohmi-tessekere.in2p3.fr/>) and various interdisciplinary projects at the crossroads of the environment, health, and societies. In this way, this paper is also an analysis based on ten years of research and immersion in the Senegalese Ferlo region, the area where the GGW is being implemented in Senegal. Our previous research in the Ferlo has focused on the ecological impact of the GGW initiative (e.g., Niang et al. 2014, Sagna et al. 2014, Sylla et al. 2019a, Niang and Ndiaye 2021) as well as the social perceptions related to its implementation in the area (e.g., Ka 2016, Ka et al. 2021) or the “lifeworlds” (Chevé and Wane 2018, Macia et al. 2022) of the Ferlo populations (e.g., Duboz et al. 2021, Macia et al. 2021). Data were collected every year, with field work visits ranging from a few weeks to a few months. This monitoring of GGW activities (as well as their impacts on animal, plant, and human populations and on the biotope of the Senegalese Ferlo) allows us to consider the objectives of the GGW Accelerator in light of the ecological and socioeconomic evolution studied by researchers for over 10 years.

Within the framework of this analytical approach, the bibliographic work carried out was in no way intended to be exhaustive. It was guided by our interdisciplinary approach, by a focus on temporality, and, of course, by our collective field experience in the Senegalese Ferlo. The conclusions of this article are therefore not intended to extend to the entire GGW program.

## **THE GREAT GREEN WALL AND ITS ACCELERATOR: BETWEEN ECOLOGY AND POWER RELATIONS**

### **Desertification in the Sahel: ecology and controversy**

The desiccation/desertification of the Sahel has been a tested idea for more than a century (for an analytical review, see Benjaminsen and Hiernaux 2019). From the 16th to the 18th century, Western settlers exploring the arid territories attributed droughts to divine punishment of indigenous sinners (Davis 2016). From the 18th century onward, and increasingly with the expansion and institutionalization of colonialism in the 19th and 20th centuries, the narrative of Sahelian droughts changed and the idea of desertification was gradually linked to local people’s misuse of the land: overgrazing, bush fires, felling of trees for fuelwood, etc. (Benjaminsen and Hiernaux 2019). This discourse on desertification made it possible to legitimize colonial control over territories previously managed by local populations (Roe 1999).

There now seems to be a scientific consensus that local land use is not the cause of major Sahelian droughts (for a review, see Giannini et al. 2008). Sahelian droughts do not originate on land,

as long envisaged, but in the oceans. More precisely, rainfall in the Sahel is directly dependent on the warming of the tropical oceans, especially on temperature differences between the Indian Ocean and the northern and southern parts of the Atlantic Ocean (Giannini et al. 2003, Lu and Delworth 2005, Hoerling et al. 2006). Typically, El Niño leads to a warming of the Indian Ocean and the South Atlantic, resulting in particularly pronounced Sahelian droughts (e.g., Giannini et al. 2005). However, interactions between the land surface and atmosphere also likely play a feedback role in rainfall. Indeed, the decrease in precipitation favors the development of sand and dust aerosols that, in turn, modify the regional climate by contributing to the interception, reflection, and absorption of solar radiation (Choobari et al. 2014). These phenomena raise the temperature of the atmosphere (Kaufman et al. 2002, Middleton and Kang 2017, Kok et al. 2018), change its relative humidity and stability, and thus alter the life cycle of clouds and their hygrometry (Huang et al. 2017). These dust storms eventually inhibit vegetation greening and biomass development (Engelstaedter et al. 2003, Fan et al. 2014), leading to a decrease in vegetation cover and further exacerbating the decrease in precipitation by increasing solar radiation reflected from the soil (e.g., Charney et al. 1975). As a result of these phenomena, the Sahara is estimated to have grown by 10% during the 20th century (Thomas and Nigam 2018) and vegetation is reported to be steadily decreasing, thereby affecting ecosystem services (Pricope et al. 2013).

Despite the consensus that the Sahelian droughts of the 20th century were due to warming of the tropical oceans and thus to global change and widespread industrialization, some researchers are currently observing a “re-greening” of the Sahel (Olsson et al. 2005, Brandt et al. 2016). For example, Dardel et al. (2014) have shown, using remote sensing and field observations, that practically the entire Sahel was in a greening phase between 1981 and 2011, with the exception of its western part (Mauritania, Senegal). This re-greening seems to be mainly attributable to the increase in rainfall since the 1980s (e.g., Giannini et al. 2008) and the extraordinary resilience of the Sahelian ecosystem (Dardel et al. 2014). However, anthropogenic land management actions, such as tree planting in the most eroded landscapes, also seem to have an effect on local climate and rainfall, as in the Ader Doutchi plateau in Niger (Reij et al. 2005). Similarly, through an approach between political ecology, history, and anthropology on the forest-savanna mosaic zone of the region of Kissidougou, in Guinea, Fairhead and Leach (1996) have shown how local forms of knowledge allowed the forest to develop at the expense of the savanna, contrary to what was long accepted. More recent work, combining deep learning with very high spatial resolution satellite imagery for detecting isolated woody plants over large areas, confirmed this interpretation by showing that the density of tall trees in the Sahel is relatively higher near settlements (Brandt et al. 2020).

### **A brief history of the Great Green Wall and progress of the program in Senegal**

In June 2005, during the seventh Summit of Leaders and Heads of State of the Community of Sahelo-Saharan States, the GGW program was first mentioned by the Nigerian President Olusegun Obasango. It was decided at the Summit to entrust the Senegalese President at the time, Abdoulaye Wade, to include the GGW program as part of his mandate of the environmental component

of the New Partnership for Africa's Development (e.g., Mugele 2018). After numerous meetings and working sessions initiated by Senegal from 2005 to 2009, between heads of state, environment ministers, United Nations (UN) agencies (UNCCD and UNEP), experts, and donors, the strategic orientation documents for implementing the GGW (action plan, institutional and implementation frameworks, etc.) were adopted by the 11 countries concerned: from west to east, Senegal, Mauritania, Mali, Burkina Faso, Niger, Nigeria, Chad, Sudan, Ethiopia, Eritrea, and Djibouti. The first plantations were completed in 2008, with, of course, major differences depending on both the ecological and political local context (Dia and Niang 2010).

As a pan-African program conceived, initiated, and implemented by the Sahelian states, the GGW is being developed around a dual objective: combatting desertification and promoting biodiversity as its ecological component, and developing the resources of the populations and combatting poverty as its social component. From the outset, the GGW was designed by the African Union as a pan-African program to be implemented locally through a participatory approach and involving the populations living along its route. Thus, the initiative is coordinated globally by Pan-African Agency of the Great Green Wall (PAGGW), and managed in each country by a national agency (as in Senegal, for example) or a "focal point" when resources allocated do not allow for such a structure (as in Burkina Faso). This type of organization leaves a great deal of freedom to each state for the implementation of "its" portion of the GGW, allowing this pan-African program to be adapted to the contingency of local situations.

Because each country independently implements actions contributing to the GGW, it appears particularly difficult to take a general overview of the progress of the program. For example, according to the PAGGW (2018), between 2011 and 2017, actions in Niger included mobilizing and capturing runoff and groundwater, fixing dunes, protecting plots of land, improving cultivation techniques, and establishing firebreaks, and a total of 367,000 hectares were said to be "restored." In Burkina Faso, GGW actions resulted in the protection of plots of land, the installation of stone barriers to retain water, the development of zaïes, and the construction of improved three-stone stoves (PAGGW 2018). This set of diverse actions makes quantitative comparisons on the surface areas of land known as "restored" on the GGW route inoperable. Thus, to give a precise and concrete example of progress, we will focus our attention on the case of Senegal, considered to be the most proactive country in the implementation of the GGW program (Dia and Duponnois 2010, Mugele 2018).

In Senegal, between 2008 and 2021, 57,000 hectares were officially reforested: i.e., an average of just over 4,000 hectares per year, with some plots being replanted annually (Sarr 2020, 2022). This reforestation was made possible by the breeding of 15,032,350 seedlings in nine nurseries in the Sahelian territory, followed by the protection of the plots by a fence around them (Sarr 2020). During the rainy season (August and September), the seedlings were planted by many people: government agents, inhabitants of the communes concerned, young volunteers, and students. A similar methodology has been well described by Sacande and Berrahmouni (2016) in Burkina Faso, Mali, and Niger. During this period, more than 1500 km of firebreaks were installed and

maintained. Firebreaks are necessary elements for the establishment of reforestation plots because bush fires are frequent and devastating in the region.

These figures, which some may consider modest, can be explained by several factors. First of all, from a sustainability perspective, it appears that plots planted during a year must be monitored, maintained, and even replenished because of the mortality of shrubs inherent in this type of operation, the movement of livestock when they manage to penetrate the plots, etc. Moreover, the area in which the GGW is operating in Senegal, as on the entire route, is populated by men and women who live there, raise livestock, and sometimes practice a little agriculture. It is precisely for this reason that the GGW in Senegal involves the construction of multipurpose gardens in which women in the villages affected by the project grow and harvest fruit and vegetables that are then consumed or sold at local weekly markets (Billen 2015). This income-generating activity, which is specifically geared toward empowering women, is coupled with an activity that allows straw to be harvested within GGW plots during the lean season (corresponding to May, June, and July in Senegal). Together, these two development activities generated, for example, 20,000,000 FCFA ( $\approx$  30,000 €) between 2014 and 2015, for the benefit of populations located along the entire Senegalese GGW route (Boëtsch et al. 2019). Thus, without talking about success or failure, the GGW has produced tangible results in Senegal in favor of ecological restoration and the improvement of the populations' living conditions (Turner et al. 2021).

#### **The GGW Accelerator**

In January 2021, the third One Planet Summit was organized by France, the United Nations, and the World Bank. In Paris, the French President, Emmanuel Macron, urged for more action as agreed to during the 2015 Paris Agreement, declaring that we were losing the battle against climate change. A critical analysis would point out that this failure was foreseeable because the vast majority of the measures taken were simply reiterations, without any real paradigm shift (Allan 2019). In this context, the initiators of the summit proposed to take immediate action for the climate by bringing together leaders from the political world, the private sector, international organizations, financial institutions, foundations, non-governmental organizations (NGOs), and citizens, with the aim of selecting and investing funds in various climate actions. On the sidelines of the One Planet Summit, the GGW Investment Forum was held, hosted by the French President and the Prince of Wales.

At this forum, the GGW Accelerator initiative was announced. In the concluding speech,<sup>[2]</sup> the French President began by recalling France's investment in the security and stability of the Sahel. After mentioning the challenge of feeding the Sahelian populations, "weakened by terrorism," Emmanuel Macron turned to the ecological challenges: biodiversity, the fight against desertification, and global warming. Affirming that all of these challenges (security, food, ecological) find a common solution in the GGW, but also that "for the past 15 years, the Great Green Wall has had its ups and downs," he believes that "the scepticism [surrounding this pan-African program] will be put to rest" thanks to the public and private funding mobilized during this edition of the One Planet Summit. Noting the knowledge gathered on the GGW ("we now know what doesn't work"<sup>[3]</sup>) he now wants to

“accelerate the movement” by 2030, by (1) restoring 100 million hectares of degraded land, (2) sequestering 250 million tons of carbon, and (3) creating 10 million jobs. Thus: “the Accelerator completely changes the game on the initiative we are talking about” [i.e., the GGW] and he then concluded: “I want to believe that we are changing the conditions for the success of this Great Green Wall [...] if we manage to achieve the results we have set ourselves, we can truly change the future of the 11 countries and the African continent.”

The GGW Accelerator is hosted by the United Nations Convention to Combat Desertification (UNCCD) in partnership with the PAGGW. The GGW Accelerator includes five pillars: (1) investment in small and medium enterprises and strengthening of value chains, (2) land restoration and sustainable ecosystem management, (3) climate-resilient infrastructure and access to renewable energy, (4) enabling economic and institutional framework for effective governance, and (5) capacity building.

The GGW Accelerator program is funded by the following organizations: the World Bank, the International Fund for Agricultural Development (IFAD) in partnership with the Green Climate Fund, the European Investment Bank, DG DEVCO (International Cooperation and Development) and the European Commission, the Food and Agriculture Organization (FAO), the Global Environment Facility (GEF), the Agence Française de Développement (for France), the African Development Bank, and “major financial players.”<sup>[4]</sup>

Six months after the One Planet Summit, billionaire Jeff Bezos (just back from his space trip) pledged a donation of one billion dollars to the GGW Accelerator, bringing the total to 15 billion dollars. By October 2021 in Glasgow, at the 2021 United Nations Climate Change Conference (COP 26), the sum had risen to 19 billion dollars. If the 19 billion dollars were actually invested in the GGW (and distributed evenly among the 11 states along the GGW route), this Accelerator would inject more than 1.5 billion dollars into the program until 2030 in Senegal alone. This is approximately 100 times what was invested by the Senegalese state between 2008 and 2019 (18 million dollars; United Nations [UN] 2020). As Benjaminsen and Hiernaux (2019) point out, investing in GGW is an exceptional opportunity for Western leaders to demonstrate their interest in the environment, in the form of a partnership with African states, while avoiding implementing drastic and unpopular measures in their own countries. At a time when the world’s leading economies are unable to take measures to limit global warming and the biodiversity crisis (Svarstad and Benjaminsen 2017), they have therefore chosen to invest massively in the GGW program.

However, this does not mean that the GGW Accelerator is the only initiative to intervene, either in the GGW or in the Sahel zone. Indeed, many other NGOs are already working with populations (e.g., Action Against Hunger) or in the GGW (e.g., Agronomes et Vétérinaires Sans Frontières). Other international organizations, such as the FAO, have been working for several years in collaboration with the GGW Agency in Senegal, and are also integrated into the Accelerator. A draft diagram of these complex relationships is proposed in Figure 1.

The sudden, but very visible, investment of the French President in the GGW Accelerator takes place in this context. COP 26 was

the last major global environmental event before the French presidential elections in May 2022. As in many countries across the world, a large number of French citizens declare being increasingly concerned by climate change and environmental issues as a whole (Shwom et al. 2015). More than 80% of the French population already considered that the impact of climate change was “serious,” “disastrous,” or “cataclysmic” in 2015 (Douenne and Fabre 2019). However, measures designed by the French government to tackle these issues, such as a carbon tax, have proved unpopular. In a national context where representations of climate change are little influenced by benchmarks partisans (partisan cues; Douenne and Fabre 2019), the GGW was an opportunity for the president to demonstrate that he takes the environmental crisis very seriously without alienating an electorate reluctant to pay the price.

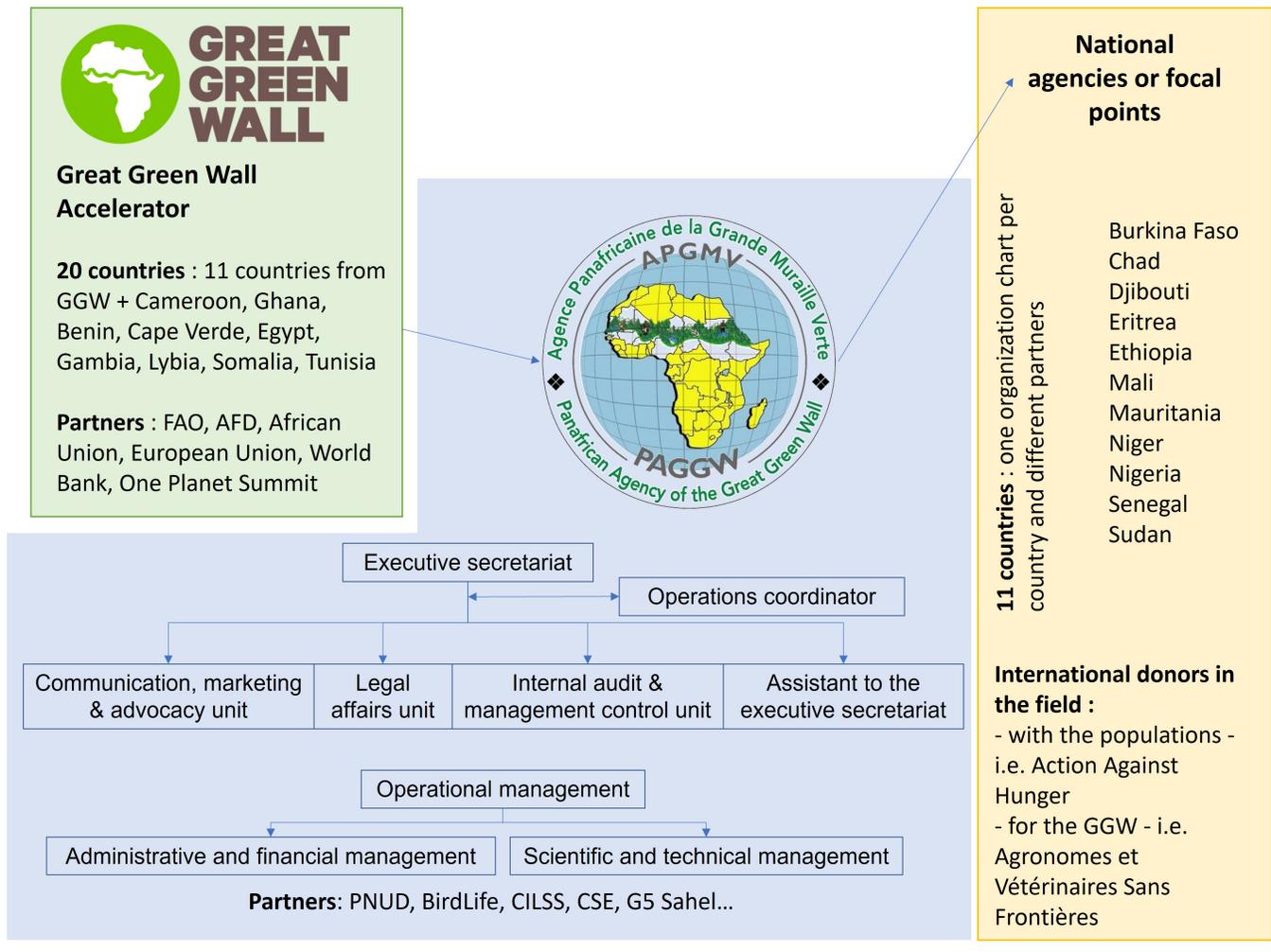
## ACCELERATION AND THE GREAT GREEN WALL: POLITICS, NATURE, AND PEOPLE

### Acceleration and Western post-modernity

For the French President, the GGW Accelerator is a “paradigm shift.” The French President’s speech at the conclusion of this forum (as in the conclusion of the “Great Green Wall meeting” at COP 26 in Glasgow<sup>[5]</sup>) presents him as the leader of the Accelerator, whereas the GGW was originally a pan-African program. Against the backdrop of this desire for acceleration, the well-known stereotype of African slowness (e.g., Diallo 2019) seems to be emerging, explaining the “scepticism” about the GGW. In a barely concealed way, the French President is trying to speed up a pan-African process that is too slow. By discrediting the actions of African states in this way, Western powers, represented by France and the United Kingdom, are legitimizing their hold on the program and becoming its main sponsors, as is particularly visible in this quotation of the French President: “if we manage to achieve the results we have set ourselves, we can truly change the future of the 11 countries and the African continent” (italics added by the authors). It should also be noted that this Western appropriation does not, for the moment, raise any objections from African leaders; they probably also hope to be among the winners (Roe 1994) of this acceleration and to benefit from this massive influx of donations.

However, if the slowness of the implementation of the GGW is pointed out by Western leaders to legitimize their appropriation of the program, the work of the philosopher Hartmut Rosa suggests that the notion of acceleration would probably be more relevant for analyzing Western post-modernity than that of slowness for analyzing Sahelian societies. In his book *Social Acceleration: A New Theory on Modernity*, Rosa (2013) intends to demonstrate that a major characteristic of post-modernity, which can be briefly defined as the disaggregation of the social and cultural norms constitutive of modernity (for more details, see Lyotard 1979, Featherstone 1991, Bauman 1995), is precisely the acceleration of temporal structures. On reading Hartmut Rosa, it appears that the vocabulary of the GGW Accelerator is undeniably revealing of an era (post-modernity), of a cultural area (the West), and of the history of its relations with Africa. Bensa (1997) reminds us of “the relationship to time, because it is first and foremost a relationship to action, [it] is also, fundamentally, a relationship to power. The time of the dominated is taken by that of the dominant.” Thus, by controlling

**Fig. 1.** Positioning of the Pan-African Agency of the Great Green Wall (PAGGW), local agencies of the Great Green Wall (GGW), and GGW Accelerator.



the temporality of the GGW program and confiscating it from the Sahelian states through this Accelerator, it is the domination of the Western powers over the Sahelian states that emerges from the analysis, making the Accelerator part of a neo-colonial approach (Benjaminsen 2021), understood here as the control of less-developed countries by developed countries through indirect means (see D’Souza 2007). However, this desire to accelerate may be in contradiction with the time of ecological restoration and the time experienced by local populations.

#### Acceleration and timing of ecological restoration

The implementation of the GGW in Senegal was carried out by using a bottom-up, participatory approach, involving the populations in its design and implementation. Plant species, essentially indigenous, were selected for their resistance to water stress; their ecological plasticity; and their economic value, whether food, pastoral, commercial, energetical, medicinal, or cultural (Niang et al. 2014). Thus, in the Senegalese Ferlo region, where phytoremediation activities have been carried out since 2008, the main species used for reforestation campaigns have been

acacias (*Acacia raddiana*, *Acacia seyal*, *Acacia senegal*, *Acacia nilotica*) and other species adapted to the environment, such as *Balanites aegyptiaca* (desert date palm) and *Zizyphus mauritiana* (jujube tree).

Today, the oldest plantations in the Senegalese GGW are 14 years old and, for most of them, protection was lifted after nine to 11 years. The study of land use dynamics in the first GGW intervention areas in Senegal showed that forestry areas increased from 0.08% in 1984 to 2.66% in 2015 thanks, at least in part, to the plantations implemented under the program (Sylla et al. 2019b). The results of these developments remain, to date, modest because of the low recovery and survival rates of seedlings in the Sahel (Bernardino et al. 2020) and, above all, the long growing time of most of the selected Sahelian species (Wade 2020). More specifically, some studies have shown that most Sahelian species face significant abiotic constraints, associated with growth rates of between 8 and 13 cm in three years after being transferred to the soil (Laminou Manzo et al. 2009). Under these conditions, accelerating reforestation in the Sahel appears delicate and

complex, requiring either the planting of faster-growing but exogenous species that are poorly adapted to the environment, or local transformation of the soil through the use of fertilizers or external watering over the long term. In the current situation, corresponding to the planting of local species under natural climatic conditions, the results obtained in the framework of GGW monitoring in Senegal have shown a good natural regeneration dynamic, but it is necessary to wait between seven and 10 years to observe real changes in the physiognomy of the vegetation (Diallo et al. 2012). However, alternative approaches combining the planting of slow-growing woody plants with fast-growing edible herbaceous and fodder species for livestock would have shown benefits in only one year with the harvesting of edible grass seeds and collecting of fodder from the plots (Sacande and Berrahmouni 2016; unfortunately, quantitative data are not presented in the article).

Natural regeneration cycles in the dry zone take place over periods of several years or even several decades (Bellefontaine 2005, Wade 2020). Given the inter-annual rainfall variability in the Ferlo region (Sarr 2009), some years are favorable for natural regeneration, whereas others must be dedicated to the consolidation and protection of replanted plots. This balance between planting and protection is all the more important as the rainy season becomes increasingly erratic (Cissé et al. 2016), rainfall being more intense but intermittent (Biasutti 2019) and the associated logistical activities having to be carried out in ever shorter, less predictable periods of time. Taken together, this suggests that the timeframe for implementing GGW must be spread over several decades. The trees must have time to take root and grow. At least a decade is needed before the impact of reforestation is felt (Sylla Gaye 1989). Similarly, a study of the potential impacts of GGW across the Sahel shows that a minimum of 10 years is needed for restoration activities to break even from a social perspective, taking into account market and non-market ecosystem benefits (Mirzabaev et al. 2022).

Thus, the climatic and ecological data for the Sahel indicate that nature is not, in the words of Hartmut Rosa (2020), “available.” Nature is deaf to ecological policies’ injunctions to accelerate. The desire to accelerate the GGW with a massive investment until 2030 still corresponds to this perception of a nature made available, in this case mainly to Western political interests. For the moment, we can suppose that it would take about two years to plan and develop Accelerator projects and one year to start them up. This first stage would be followed by a five-year implementation period (which may be extended by a couple of years, common in these kind of approaches). However, it seems that the implementation of the GGW must be planned over decades, in line with the local ecosystem and the human resources that can be mobilized locally, resources that are limited because of the harshness of living conditions, as we will see now. Therefore, some researchers have recommended giving particular importance to the sustainability of funding programs within the framework of the GGW (Mechiche-Alami et al. 2022).

#### **Acceleration and lifeworlds of Sahelian populations: the case of the Senegalese Ferlo**

In order to analyze the temporal structures of Sahelian populations located along the GGW, the example of the Senegalese Ferlo will be developed here within the framework of

the triple acceleration described by Rosa (2013): technical acceleration (transport, communications, production); social structures; and the rhythm of life.

The sylvo-pastoral area of the Ferlo, located six hours by road from the capital (including more than two hours by sand and laterite track), is still an isolated area of northern Senegal. Almost exclusively populated by Fulani, mainly pastoralists, life here is punctuated by transhumance, which is necessary to feed the herds during the dry season lasting between eight and ten months. Three quarters of the Ferlo population cannot read or write (e.g., Duboz et al. 2017), and there is no running water or electricity (beyond solar in some very rare camps). In the commune of Tèssékéré, for example, there is a health center in each village (Widou-Thiengoly, Amaly, and Tèssékéré) for a population of nearly 8000.<sup>[6]</sup> Basic medicines are not always available and there is no local medical care in case of emergency.

From Durkheim to Levi-Strauss, via Evans-Pritchard, anthropology has long considered the time of non-Western populations as cyclical, if not static (for reviews, see Munn 1992, Bensa 1997). Rosa himself (2013:18) recalls this cyclical conception of time in “simple, undifferentiated societies” in the introduction to his book on acceleration. Yet in the Ferlo, technical acceleration is beginning to be felt. First of all, it is felt in terms of communication: mobile phones and WhatsApp groups have multiplied, even though the price of communications remains high and therefore limits their use (May 2019). As in Kenya, they have become working tools for pastoralists (Butt 2015). Transformations are also visible in transport. Although still few in number, motorbikes and cars are appearing more frequently; carts have become widespread; Wopuyah (pick-ups modified for transport) are leaving the villages each day for the nearest urban centres: Dahra Djolof, Linguère, Richard-Toll, and Ndioum.

From Dakar, travel time has been reduced by 25% in two years (2018–2020), from eight hours to six hours by car, through the construction of asphalt and laterite roads. On the other hand, there seems to be little acceleration of the means of production at the local level: purchases are calculated and made profitable, recycled if necessary, in order to correspond with low household incomes. Calabashes, kitchen utensils, mats, and beds are not intended to be changed at the speed imposed by economic liberalism in the West.

Correlatively, the social structures of the Ferlo seem to be characterized by their stability despite political and administrative changes: family and professional cycles are durable, elders are respected, and identities seem stable (e.g., Macia et al. 2019). The close association between Fulani identity and pastoralism is a well-established anthropological fact (e.g., Botte et al. 1999). In the Ferlo society, the mode of subjectivation does not seem to value the multiplication of subjective experiences. However, the youngest would like to “modernize” livestock farming in order to “live better” (Duboz et al. 2021). In this society, change is not about knowledge becoming obsolete more quickly, the shortening of family (marriages, divorces, family reunification) and professional cycles, or the loss of power of elders. These are not identities that have become “situational” (Rosa 2013) or “recyclable” (Turner 1994). Through participation in WhatsApp groups, through the possibility of traveling (more)

quickly to Dakar to work or study, or to Dahra (the nearest town) to host a radio program, identities in the Ferlo are gradually extended by the technical means available.

Finally, the last type of acceleration mentioned by Rosa is that of the rhythm of life, which corresponds to the multiplication of actions and experiences lived in a limited amount of time, as well as to the subjective experience of its lack. For Rosa, technical acceleration has not freed up time (especially for what we consider important) but has instead multiplied tasks. In the Senegalese Ferlo, life seems to be punctuated by daily pastoral activities: guiding the herds into the bush to feed them; milking the cows; fetching water from the borehole or from the ponds when they are still there; cutting and gathering wood; picking certain plants for therapeutic, sanitary, or cosmetic use; building the huts; cooking; cleaning the camp; and going to the weekly market. Despite the stability of these activities, some people also complain about the lack of time: this is the case for the youngest, both men and women (Duboz et al. 2021). The youngest are old enough to do things for those who are too old, and they note, through the fatigue they feel, that these tasks have become increasingly time consuming with climate change and the increase in the size of livestock.

Far from portraying the temporality of the Ferlo populations as static, the analysis shows that their actions, through technology, have diversified over the last decade. Identities are changing. However, the acceleration advocated by Western economic liberalism seems to be coming up against resistance that is rooted in an identity that values, more than the logic of competition and the multiplication of experiences, community solidarity, the stability of social structures, and the closeness between humans, their herds, and nature. These resistances to the values of contemporary Western societies are mostly silent because they are most often deployed without ostentation. They have recently been described in Senegal as both passive (i.e., inscribed in the history of the people and at the edge of individual consciousness) and active (i.e., conscious and opposed to the productive control of the population; Macia et al. 2022). In other words, the values of the liberal economy are confronted with community *habitus* and *hexis* cemented in apparatuses allowing the internalization of the lineage principle and of socialization processes teaching the sense of sharing and collective belonging (Marie 1997). These values are part of a long time frame, detached from the opportunistic urgencies of politics. This temporality of the population appears to be more in line with the time of nature than with the time of the GGW Accelerator policy.

## CONCLUSION

Through the prism of the GGW and its Accelerator, this article shows that the temporalities of politics, ecological restoration, and Sahelian populations can hardly be reconciled under the notion of acceleration. Nature is no more available than the Sahelian populations to political injunctions. The GGW, if it is not a mere utopia, can only be a long-term program. But beyond this critical observation, how could this clash of temporalities be mitigated? How could the funds allocated to the Accelerator be used?

First of all, it seems necessary to analyze the compatibility of time: the time of politics; the time of climate change, increasingly characterized by extreme episodes in the Sahel; the time of

ecological restoration, which implies multi-year strategies; the time of the societies settled on the route. These conflicting temporalities seem to be able to share a first window around a ten-year horizon: minimum time for observing sustainable effects of restoration, sufficient time for analyzing social transformations and time that can be envisaged for medium-term political programs, despite the inherent contingency of political life. Second, it seems fundamental to soon put the local populations back at the heart of the program, whose participatory aspect is, in everyone's opinion, necessary. Thus, it seems that pillars three, four, and five of the Accelerator, with their vague contours, remote from the concrete realities of individuals and giving a major place to administrative actors, should remain minor, at the risk of leading the populations involved in the GGW to become mere beneficiaries. Finally, the acceleration of the GGW must also consist of an acceleration of dedicated research in order to systematize current approaches and data and to detail scenarios for the transformation of Sahelian landscapes. But this will take time.

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[1] FAQs - Accélérateur de la Grande Muraille Verte (GMV). <https://static1.squarespace.com/static/564a15a0e4b0773edf86e3b4/t/61405f48c0d73321308d5435/1631608648684/GGWA+FAQ+FR.pdf>.

[2] Conclusion du Forum d'investissement de la Grande muraille verte - One Planet Summit. <https://www.youtube.com/watch?v=J2aub5itMfE>.

[3] It should be noted that “knowing what doesn't work“ certainly helps to avoid certain pitfalls, but is in no way synonymous with “knowing what works.”

[4] Great Green Wall Accelerator Technical brief - Edition N°1 September 2021. [https://static1.squarespace.com/static/564a15a0e4b0773edf86e3b4/t/6152fd627c3cb34be41dbe29/1632828805698/Technical+brief+GGWA+sept21\\_clean.pdf](https://static1.squarespace.com/static/564a15a0e4b0773edf86e3b4/t/6152fd627c3cb34be41dbe29/1632828805698/Technical+brief+GGWA+sept21_clean.pdf).

[5] COP26 réunion dédiée à la Grande muraille verte | Conclusion du Président Emmanuel Macron. <https://www.youtube.com/watch?v=9orWicPKN4c>.

[6] [http://lod.ansd.sn:8080/searching/after/index.jsp?dsname=&path=REPERTOIRES\\_LOCALITES\\_SN&keywords=Tessekre+forage](http://lod.ansd.sn:8080/searching/after/index.jsp?dsname=&path=REPERTOIRES_LOCALITES_SN&keywords=Tessekre+forage).

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## Data Availability:

*Data/code sharing is not applicable to this article because no data/code were analyzed in this study.*

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## LITERATURE CITED

- Allan, J. I. 2019. Dangerous incrementalism of the Paris Agreement. *Global Environmental Politics* 19(1):4-11. [https://doi.org/10.1162/glep\\_a\\_00488](https://doi.org/10.1162/glep_a_00488)
- Bauman, Z. 1995. *Life in fragments: essays in postmodern morality*. Blackwell, Oxford, UK.
- Bellefontaine, R. 2005. Régénération naturelle à faible coût dans le cadre de l'aménagement forestier en zones tropicales sèches en Afrique. *Vertigo* 6(2):4335. <https://doi.org/10.4000/vertigo.4335>
- Benjaminsen, T. A. 2021. Depicting decline: images and myths in environmental discourse analysis. *Landscape Research* 46(2):211-225. <https://doi.org/10.1080/01426397.2020.1737663>
- Benjaminsen, T. A., and P. Hiernaux. 2019. From desiccation to global climate change: a history of the desertification narrative in the West African Sahel, 1900-2018. *Global Environment* 12(1):206-236. <https://doi.org/10.3197/ge.2019.120109>
- Benjaminsen, T. A., and H. Svarstad. 2009. Qu'est-ce que la "political ecology"? *Natures Sciences Sociétés* 17:3-11. <https://doi.org/10.1051/nss/2009002>
- Bensa, A. 1997. Images et usages du temps. *Terrain* 29:5-18. <https://doi.org/10.4000/terrain.3190>
- Bernardino, P. N., M. Brandt, W. De Keersmaecker, S. Horion, R. Fensholt, I. Storms, J. P. Wigneron, J. Verbesselt, and B. Somers. 2020. Uncovering dryland woody dynamics using optical, microwave, and field data—prolonged above-average rainfall paradoxically contributes to woody plant die-off in the Western Sahel. *Remote Sensing* 12(14):2332. <https://doi.org/10.3390/rs12142332>
- Biasutti, M. 2019. Rainfall trends in the African Sahel: characteristics, processes, and causes. *WIREs Climate Change* 10(4):e591. <https://doi.org/10.1002/wcc.591>
- Billen, L. 2015. Les jardins féminins de la Grande Muraille Verte dans le Ferlo sénégalais: une réponse publique à la précarité et à la marginalité en milieu rural au Sud. *Pour* 225:167-177. <https://doi.org/10.3917/pour.225.0167>
- Blaikie, P. 1999. A review of political ecology: issues, epistemology and analytical narratives. *Zeitschrift für Wirtschaftsgeographie* 43(3-4):131-147. <https://doi.org/10.1515/zfw.1999.0009>
- Blaikie, P. 2001. Social nature and environmental policy in the South: views from the verandah and veld. Pages 133-150 in N. Castree and B. Braun, editors. *Social nature: theory, practice, and politics*. Blackwell, Oxford, UK.
- Blaikie, P., and J. S. S. Muldavin. 2004. Upstream, downstream, China, India: the politics of environment in the Himalayan region. *Annals of the Association of American Geographers* 94(3):520-548. <https://doi.org/10.1111/j.1467-8306.2004.00412.x>
- Boëtsch, G., P. Duboz, A. Guisse, and P. Sarr. 2019. *La grande muraille verte. Une réponse africaine au changement climatique*. CNRS Editions, Paris, France.
- Botte, R., J. Boutrais, and J. Schmitz, editors. 1999. *Figures peules*. Karthala, Paris, France.
- Brandt, M., P. Hiernaux, K. Rasmussen, C. Mbow, L. Kergoat, T. Tagesson, Y. Z. Ibrahim, A. Wélé, C. J. Tucker, and R. Fensholt. 2016. Assessing woody vegetation trends in Sahelian drylands using MODIS based seasonal metrics. *Remote Sensing of Environment* 183:215-225. <https://doi.org/10.1016/j.rse.2016.05.027>
- Brandt, M., C. J. Tucker, A. Kariryaa, K. Rasmussen, C. Abel, J. Small, J. Chave, L. V. Rasmussen, P. Hiernaux, A. A. Diouf, et al. 2020. An unexpectedly large count of trees in the West African Sahara and Sahel. *Nature* 587:78-82. <https://doi.org/10.1038/s41586-020-2824-5>
- Butt, B. 2015. Herding by mobile phone: technology, social networks and the "transformation" of pastoral herding in East Africa. *Human Ecology* 43:1-14. <https://doi.org/10.1007/s10745-014-9710-4>
- Charney, J., P. H. Stone, and W. J. Quirk. 1975. Drought in the Sahara: a biogeophysical feedback mechanism. *Science* 187(4175):434-435. <https://doi.org/10.1126/science.187.4175.434>
- Chevé, D., and C. T. Wane. 2018. Ce que lutter veut dire? Lamb, bère et monde de vie au Sénégal. *Corps* 16:11-26. <https://doi.org/10.3917/corp1.016.0011>
- Chooari, O. A., P. Zawar-Reza, and A. Sturman. 2014. The global distribution of mineral dust and its impacts on the climate system: a review. *Atmospheric Research* 138:152-165. <https://doi.org/10.1016/j.atmosres.2013.11.007>
- Cissé, S., L. Eymard, C. Ottlé, J. A. Ndione, A. T. Gaye, and F. Pinsard. 2016. Rainfall intra-seasonal variability and vegetation growth in the Ferlo Basin (Senegal). *Remote Sensing* 8(1):66. <https://doi.org/10.3390/rs8010066>
- Dardel, C., L. Kergoat, P. Hiernaux, E. Mougou, M. Grippa, and C. J. Tucker. 2014. Re-greening Sahel: 30 years of remote sensing data and field observations (Mali, Niger). *Remote Sensing of Environment* 140:350-364. <https://doi.org/10.1016/j.rse.2013.09.011>
- Davis, D. K. 2016. *The arid lands: history, power, knowledge*. MIT Press, Cambridge, Massachusetts, USA.
- de Vries, D. H. 2019. Surprise ecologies: case studies on temporal vulnerability in four North American floodplains. *Ecology and Society* 24(4):37. <https://doi.org/10.5751/ES-11274-240437>
- Dia, A., and R. Duponnois. 2010. *Le projet majeur africain de la Grande Muraille Verte: concepts et mise en œuvre*. IRD Éditions, Marseille, France. <https://doi.org/10.4000/books.irdeditions.2106>
- Dia, A., and A. M. Niang. 2010. *Le Projet Majeur de la Grande Muraille Verte de l'Afrique: contexte, historique, approche stratégique, impacts attendus et gouvernance*. In A. Dia and R. Duponnois, editors. *Le projet majeur africain de la Grande Muraille Verte: concepts et mise en œuvre*. IRD Éditions, Marseille, France. <https://doi.org/10.4000/books.irdeditions.2110>
- Diallo, A., E. C. Agbangba, A. Thiaw, and A. Guissé. 2012. Structure des populations de *Acacia senegal* (L.) Willd dans la zone de Tessékéré (Ferlo nord), Sénégal. *Journal of Applied Biosciences* 59:4297-4306.

- Diallo, I. 2019. Discrimination raciale ou distinction en fonction de l'expérience professionnelle? Des ambiguïtés qui posent question. *Les cahiers de la LCD* 10:73-90. <https://doi.org/10.3917/clcd.010.0073>
- Douenne, T., and A. Fabre. 2019. French attitudes on climate change, carbon taxation and other climate policies. *Ecological Economics* 169:106496. <https://doi.org/10.1016/j.ecolecon.2019.106496>
- D'Souza, R. 2007. Colonialism, neo-colonialism, post-colonialism. In M. Hartwig, editor. *Dictionary of critical realism*. Routledge, London, UK.
- Duboz, P., G. Boëtsch, L. Gueye, and E. Macia. 2017. Self-rated health in Senegal: a comparison between urban and rural areas. *PLoS ONE* 12(9):e0184416. <https://doi.org/10.1371/journal.pone.0184416>
- Duboz, P., E. Macia, A. H. Diallo, E. Cohen, A. Bergouignan, and S. M. Seck. 2021. The good life in rural and urban Senegal: a qualitative and quantitative study. *PLoS ONE* 16(5):e0252134. <https://doi.org/10.1371/journal.pone.0252134>
- Engelstaedter, S., K. E. Kohfeld, I. Tegen, and S. P. Harrison. 2003. Controls of dust emissions by vegetation and topographic depressions: an evaluation using dust storm frequency data. *Geophysical Research Letters* 30(6):1294. <https://doi.org/10.1029/2002GL016471>
- Fairhead, J., and M. Leach. 1996. *Misreading the African landscape: society and ecology in a forest-savanna mosaic*. Cambridge University Press, Cambridge, UK. <https://doi.org/10.1017/CBO9781139164023>
- Fan, B., L. Guo, N. Li, J. Chen, H. Lin, X. Zhang, M. Shen, Y. Rao, C. Wang, and L. Ma. 2014. Earlier vegetation green-up has reduced spring dust storms. *Scientific Reports* 4:6749. <https://doi.org/10.1038/srep06749>
- Featherstone, M. 1991. *Consumer culture and postmodernism*. Sage, London, UK. <https://dx.doi.org/10.4135/9781446288399>
- Fonseca-Cepeda, V., C. J. Idrobo, and S. Restrepo. 2019. The changing chagras: traditional ecological knowledge transformations in the Colombian Amazon. *Ecology and Society* 24(1):8. <https://doi.org/10.5751/ES-10416-240108>
- Giannini, A., M. Biasutti, and M. M. Verstraete. 2008. A climate model-based review of drought in the Sahel: desertification, the re-greening and climate change. *Global and Planetary Change* 64 (3-4):119-128. <https://doi.org/10.1016/j.gloplacha.2008.05.004>
- Giannini, A., R. Saravanan, and P. Chang. 2003. Oceanic forcing of Sahel rainfall on interannual to interdecadal time scales. *Science* 302(5647):1027-1030. <https://doi.org/10.1126/science.1089357>
- Giannini, A., R. Saravanan, and P. Chang. 2005. Dynamics of the boreal summer African monsoon in the NSIPP1 atmospheric model. *Climate Dynamics* 25:517-535. <https://doi.org/10.1007/s00382-005-0056-x>
- Gotham, K. F., and R. Campanella. 2011. Coupled vulnerability and resilience: the dynamics of cross-scale interactions in post-Katrina New Orleans. *Ecology and Society* 16(3):12. <https://doi.org/10.5751/ES-04292-160312>
- Hileman, J., and M. Lubell. 2018. The network structure of multilevel water resources governance in Central America. *Ecology and Society* 23(2):48. <https://doi.org/10.5751/ES-10282-230248>
- Hoerling, M. P., J. W. Hurrell, J. Eischeid, and A. Phillips. 2006. Detection and attribution of twentieth-century northern and southern African monsoon change. *Journal of Climate* 19 (16):3989-4008. <https://doi.org/10.1175/JCLI3842.1>
- Huang, J., Y. Li, C. Fu, F. Chen, Q. Fu, A. Dai, M. Shinoda, Z. Ma, W. Guo, Z. Li, et al. 2017. Dryland climate change: recent progress and challenges. *Reviews of Geophysics* 55(3):719-778. <https://doi.org/10.1002/2016RG000550>
- Ka, A. 2016. *Manger à Widou Thiengoly (Nord-Sénégal): de l'abondance remémorée à la dépendance au marché*. Dissertation, Cheikh Anta Diop University, Dakar, Senegal.
- Ka, A., A. Perrotton, A. Cissé, and D. Goffner. 2021. Mieux comprendre la complexification de l'occupation de l'espace pastoral au Ferlo. Un prérequis pour une bonne gestion des ressources naturelles. *Vertigo* 21(2):1-22. <https://doi.org/10.4000/vertigo.32507>
- Kaufman, Y. J., D. Tanré, and O. Boucher. 2002. A satellite view of aerosols in the climate system. *Nature* 419:215-223. <https://doi.org/10.1038/nature01091>
- Kok, J. F., D. S. Ward, N. M. Mahowald, and A. T. Evan. 2018. Global and regional importance of the direct dust-climate feedback. *Nature Communications* 9:241. <https://doi.org/10.1038/s41467-017-02620-y>
- Laminou Manzo, O., B. Campanella, and R. Paul. 2009. Sélection d'espèces ligneuses adaptées à la fixation biologique de dunes au Niger. *Geo-Eco-Trop* 33:99-106.
- Lu, J., and T. L. Delworth. 2005. Oceanic forcing of late 20th century Sahel drought. *Geophysical Research Letters* 32(22):L22706. <https://doi.org/10.1029/2005GL023316>
- Lyotard, J. F. 1979. *La condition post-moderne. Rapport sur le savoir*. Editions de Minuit, Paris, France.
- Macia, E., D. Chevé, and J. F. Havard, editors. 2022. *Biopolitiques en Afrique de l'Ouest: mondes de vie, santé, populations*. Karthala, Paris, France.
- Macia, E., L. Tibère, A. Ka, B. Faye, G. Boëtsch, P. Seksik, and P. Duboz. 2021. The diet of the Fulani of Senegal: comparison between rural and urban contexts around emblematic elements. *Anthropology of Food* 15:11708.
- Macia, E., F. B. Dial, J. M. Montepare, F. Hane, and P. Duboz. 2019. Ageing and the body: one African perspective. *Ageing & Society* 39(4):815-835. <https://doi.org/10.1017/S0144686X17001313>
- Marie, A. 1997. Du sujet communautaire au sujet individuel. Une lecture anthropologique de la réalité africaine contemporaine. Pages 53-110 in A. Marie, editor. *L'Afrique des individus*. Karthala, Paris, France. <https://doi.org/10.3917/kart.marie.2008.01.0053>
- May, M. 2019. L'insertion du téléphone portable au sein de la société pastorale de Widou Thiengoly (Ferlo Sénégal). *Usages et*

- changements dans les activités socio-économiques pastorales. Dissertation, Université Paris Sorbonne, Paris, France.
- Mechiche-Alami, A., D. O'Byrne, A. Tengberg, and L. Olsson. 2022. Evaluating the scaling potential of sustainable land management projects in the Sahelian Great Green Wall countries. *Environmental Research Letters* 17(8):84016. <https://doi.org/10.1088/1748-9326/ac8111>
- Middleton, N., and U. Kang. 2017. Sand and dust storms: impact mitigation. *Sustainability* 9(6):1053. <https://doi.org/10.3390/su9061053>
- Mirzabaev, A., M. Sacande, F. Motlagh, A. Shyrokaya, and A. Martucci. 2022. Economic efficiency and targeting of the African Great Green Wall. *Nature Sustainability* 5:17-25. <https://doi.org/10.1038/s41893-021-00801-8>
- Mugelé, R. 2018. La Grande muraille verte au Sahel: entre ambitions globales et ancrage local. *Bulletin de l'association de géographes français* 95(2):187-202. <https://doi.org/10.4000/bagf.3084>
- Munn, N. D. 1992. The cultural anthropology of time. *Annual Review of Anthropology* 21:93-123. <https://doi.org/10.1146/annurev.an.21.100192.000521>
- Niang, K., M. B. Sagna, O. Ndiaye, A. Thiaw, A. Diallo, L. E. Akpo, M. M. Saleh, N. Diome, S. Diatta, M. N. Faye, M. Gueye, A. Guissé, and D. Goffner. 2014. Revisiting tree species availability and usage in the Ferlo region of Senegal: a rationale for indigenous tree planting strategies in the context of the Great Green Wall for the Sahara and the Sahel Initiative. *Journal of Experimental Biology and Agricultural Sciences* 2(6):529-537.
- Niang, A., and P. I. Ndiaye. 2021. A large mammal survey in Koyli Alpha Community Wildlife Reserve and its surroundings in the Great Green Wall extension area in Senegal. *Journal of Threatened Taxa* 13(9):19223-19231. <https://doi.org/10.11609/jott.6890.13.9.19223-19231>
- Olsson, L., L. Eklundh, and J. Ardö. 2005. A recent greening of the Sahel—trends, patterns and potential causes. *Journal of Arid Environments* 63(3):556-566. <https://doi.org/10.1016/j.jaridenv.2005.03.008>
- PAGGW. 2018. Initiative de la Grande Muraille Verte: réalisations 2011-2017 et défis sur la trajectoire 2030. [https://www.grandemuraillevverte.org/images/GMV\\_2011-2017\\_FR.pdf](https://www.grandemuraillevverte.org/images/GMV_2011-2017_FR.pdf)
- Pricope, N. G., G. Husak, D. Lopez-Carr, C. Funk, and J. Michaelsen. 2013. The climate-population nexus in the East African Horn: emerging degradation trends in rangeland and pastoral livelihood zones. *Global Environmental Change* 23(6):1525-1541. <https://doi.org/10.1016/j.gloenvcha.2013.10.002>
- Proctor, J. D. 1998. The social construction of nature: relativist accusations, pragmatist and critical realist responses. *Annals of the Association of American Geographers* 88(3):352-376. <https://doi.org/10.1111/0004-5608.00105>
- Reij, C., G. Tappan, and A. Belemvire. 2005. Changing land management practices and vegetation on the Central Plateau of Burkina Faso (1968-2002). *Journal of Arid Environments* 63(3):642-659. <https://doi.org/10.1016/j.jaridenv.2005.03.010>
- Robbins P. 2004. Political ecology: a critical introduction. Blackwell, New York, New York, USA.
- Roe, E. 1994. Narrative policy analysis: theory and practice. Duke University Press, Durham, North Carolina, USA. <https://doi.org/10.1515/9780822381891>
- Roe, E. 1999. Except-Africa: remaking development, rethinking power. Routledge, New York, New York, USA. <https://doi.org/10.4324/9781351289887>
- Rosa, H. 2013. Social acceleration: a new theory on modernity. Columbia University Press, New York, New York, USA. <https://doi.org/10.7312/rosa14834>
- Rosa, H. 2020. The uncontrollability of the World. Polity Press, Cambridge, UK.
- Sacande, M., and N. Berrahmouni. 2016. Community participation and ecological criteria for selecting species and restoring natural capital with native species in the Sahel. *Restoration Ecology* 24(4):479-488. <https://doi.org/10.1111/rec.12337>
- Sagna, M. B., A. Diallo, A., P. S. Sarr, O. Ndiaye, D. Goffner, and A. Guisse. 2014. Biochemical composition and nutritional value of *Balanites aegyptiaca* (L.) Del fruit pulps from Northern Ferlo in Senegal. *African Journal of Biotechnology* 13(2):336-342. <https://doi.org/10.5897/AJB2013.12395>
- Sarr, M. A. 2009. Évolution récente du climat et de la végétation au Sénégal (cas du Ferlo). Dissertation, Université Jean Moulin Lyon 3, Lyon, France.
- Sarr, P. 2020. Rapport annuel d'activités 2017 de l'Agence Nationale de la Grande Muraille Verte au Sénégal. *Cahiers de l'Observatoire Hommes-Milieus International Tèssékéré* 8:31-41.
- Sarr, P. 2022. Rapports annuels d'activités 2020 et 2021 de l'Agence Nationale de la Grande Muraille Verte au Sénégal. *Cahiers de l'Observatoire Hommes-Milieus International Tèssékéré* 10:41-51.
- Shwom, R. L., A. M. McCright, S. R. Brechin, R. E. Dunlap, S. T. Marquart-Pyatt, and L. C. Hamilton. 2015. Public opinion on climate change. Pages 269-299 in R.E. Dunlap and R. J. Brulle, editors. *Climate change and society: sociological perspectives*. Oxford University Press, New York, New York, USA. <https://doi.org/10.1093/acprof:oso/9780199356102.003.0009>
- Svarstad H., and T. A. Benjaminsen. 2017. Nothing succeeds like success narratives: a case of conservation and development in the time of REDD. *Journal of Eastern African Studies* 11(3):482-505. <https://doi.org/10.1080/17531055.2017.1356622>
- Sylla, D., T. Ba, and A. Guisse. 2019a. Cartographie des changements de la couverture végétale dans les aires protégées du Ferlo (Nord Sénégal): cas de la réserve de biosphère. *Physio-Géo* 13:115-132. <https://doi.org/10.4000/physio-geo.8178>
- Sylla, D., B. Taibou, M. D. Diallo, T. Mbaye, A. Diallo, J. L. Peiry, and A. Guissé. 2019b. Dynamique de l'occupation du sol de la commune de Tèssékéré de 1984 à 2015 (Ferlo Nord, Sénégal). *Journal of Animal and Plant Sciences* 40(3):6674-6689. <https://doi.org/10.35759/JAnmPLSci.v40-3.2>

Sylla Gaye, C. 1989. Comportement d'Acacia senegal en plantation et dans la nature au Sahel sénégalais - perspectives d'avenir des reboisements gommiers. Troisième Symposium sur le Gommier et la Gomme Arabique. 25-28 October 1988. Publications de l'ISRA, Dakar, Sénégal.

Thomas, N., and S. Nigam. 2018. Twentieth-century climate change over Africa: seasonal hydroclimate trends and Sahara desert expansion. *Journal of Climate* 31(9):3349-3370. <https://doi.org/10.1175/JCLI-D-17-0187.1>

Turner, B. S. 1994. The postmodernisation of the life course: towards a new social gerontology. *Australian Journal on Ageing* 13(3):109-111. <https://doi.org/10.1111/j.1741-6612.1994.tb01080.x>

Turner, M. D., T. Carney, L. Lawler, J. Reynolds, L. Kelly, M. S. Teague, and L. Brottem. 2021. Environmental rehabilitation and the vulnerability of the poor: the case of the Great Green Wall. *Land Use Policy* 111:105750. <https://doi.org/10.1016/j.landusepol.2021.105750>

United Nations (UN). 2020. La Grande Muraille Verte: état de mise en oeuvre et perspectives à l'orée 2030. [https://catalogue.unccd.int/1551\\_Revised\\_French\\_Final\\_040920.pdf](https://catalogue.unccd.int/1551_Revised_French_Final_040920.pdf)

Voinot-Baron, W. 2020. A bitter taste of fish: the temporality of salmon, settler colonialism, and the work of well-being in a Yupiaq fishing village. *Ecology and Society* 25(2):4. <https://doi.org/10.5751/ES-11408-250204>

Wade, T. I. 2020. Réhabilitation d'écosystèmes et conservation de la biodiversité sur le tracé de la Grande Muraille Verte. Dissertation, Cheikh Anta Diop University, Dakar, Senegal.

Watts, M. 1983. *Silent violence: food, famine and peasantry in Northern Nigeria*. University of California Press, Berkeley, California, USA.