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ASSESSING HEALTH IMPACTS
OF AN ENVIRONMENTAL PAN-AFRICAN DEVELOPMENT PROJECT:
A MIGRATION PERSPECTIVE

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1 **ABSTRACT**

2 The general objective of this article is to analyze to what extent the implementation of the
3 Great Green Wall project is likely to disrupt migratory movements towards the rural
4 environment and, consequently, the socio-economic structures and health status of local
5 populations. This study was carried out in 2015 on a population sample of 500 individuals
6 living in the municipality of Tessekere, constructed using the quota method. Socioeconomic
7 and demographic characteristics, migratory status and self-rated health of individuals were
8 collected during face-to-face interviews. Statistical analyses used were Chi-square tests,
9 student and binary logistic regressions. Results show that internal migrants in the municipality
10 of Tessekere represent 13.40% of the study population. Migrants more often work as civil
11 servants, artisans, craft workers or traders than the region's native population, who are
12 generally livestock breeders or jobless. While place of birth does not play a significant role, it
13 appears that the length of residence of migrants in rural areas influences health status:
14 migrants residing in the municipality of Tessekere for less than 10 years are less likely to
15 report poor health, regardless of their sex, age, occupation, material well-being and perceived
16 stress. In conclusion, an environmental requirement (combating desertification), addressed by
17 an international political project - the Great Green Wall - and then applied at the national
18 level, has transformed the demographic, economic and health structure of a local population.
19 In conclusion, our study showed that (1) an examination of migration can offer a means of
20 interpreting the impact of development projects and the local changes they entail, and (2)
21 migration is a unique prism through which one can study how exposure to a new physical and
22 social environment influences the health of populations.

23 **Key words:** Ecology of health; Anthropology; Self Rated Health; Sahel; Great Green Wall

24

25 **1. Introduction**

26 Climate change is a global phenomenon with multiple consequences. In the Sahel, one of the
27 most vulnerable regions in the world, the 1970s were marked by intense droughts [1], that
28 ushered in an aridification process accentuated over the following decades by anthropogenic
29 factors such as the exploitation of timber resources and intensive livestock operations [2].
30 From that decade onward, local populations in Senegal adapted to the deterioration of their
31 environment. One of these adaptations consists of migration, particularly circular migration,
32 to diversify people's incomes [3]. The region therefore has not been “drained” of its
33 inhabitants, but population movements grew in intensity: the inhabitants of the Senegalese
34 Sahel have in fact become accustomed to moving more and more often in order to diversify
35 their economic resources.

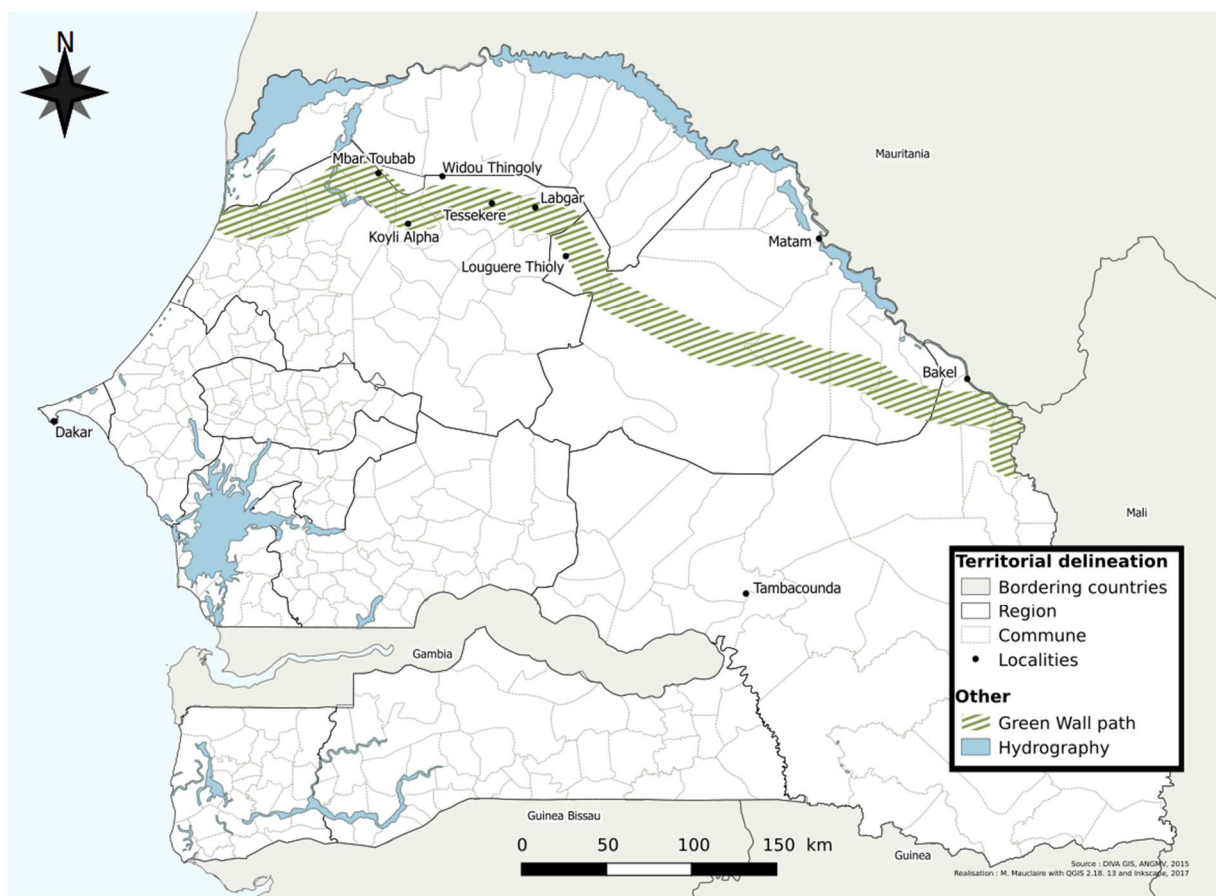
36 As Black and colleagues [4] point out, migration decisions are driven by economic, political,
37 social, demographic and environmental factors. These factors may interact with each other,
38 making the study of the links between migration and climate change more complex. These
39 links are all the more complex to study as, in addition to climate change itself, many projects
40 to combat climate change are now also being implemented, and are likely to have an influence
41 on migration movements. This is particularly the case in the Senegalese Sahel, where a
42 reforestation project called the Great Green Wall began in 2008 to restore the ecosystem. The
43 general objective of this article is to analyze to what extent the implementation of this project
44 is likely to disrupt migratory movements towards the rural environment and, consequently,
45 the socio-economic structures and health status of local populations.

46

47 **1.1. Interest of the study area: the municipality of Tessekere (Ferlo, Senegal)**

48 The municipality of Tessekere (Louga region) is located in the Senegalese Sahel, within the
49 sylvo-pastoral zone of Ferlo (Figure 1). Ferlo is a destination for migration. The lifestyle of

50 the majority population there, the Fulani, is closely related to transhumance, enabling them to
 51 offset the effects of climate variations. These seasonal pendular movements bring pastoralists
 52 and their herds from pastoral areas (in the rainy season) to irrigated areas (in the dry season),
 53 in search of pastures (Sine-Saloum, Eastern Senegal; [5]). In addition, since the 1970s and
 54 1980s, droughts, irregular rainfall and livestock intensification have led to severe
 55 environmental degradation [6,7]. In this isolated rural environment, where basic social
 56 services are very inaccessible [8] and where neither electricity nor running water are
 57 available, people have logically sought a way to diversify their economic resources through
 58 migration. This is why in 2018, in Senegal, the Louga region became much more a departure
 59 region for internal migrants than a host region; it is one of the two regions that is losing the
 60 most internal migrants [9].



61
 62 **Figure 1:** Geographic locations of the Tessekere municipality in the Ferlo region in Northern
 63 Senegal

64 However, in 2008, a pan-African development project, the Great Green Wall Initiative
65 (GGW) for the Sahara and the Sahel, jointly decided by 11 Saharan-Sahelian countries,
66 including Senegal, was launched. The objectives of this project are (1) the restoration of
67 woody species in order to slow down desertification and (2) the local economic development
68 of the terroirs. In Senegal, the Great Green Wall covers 16 rural communities, including
69 Tessekere; a pioneering area in reforestation and local development related to GGW [2].
70 To our knowledge, no studies have been carried out on the consequences of the
71 implementation of environmental development projects in this region. Studies on the
72 influence of climate change and disasters on migration are numerous [i.e., 10-12]. On the
73 other hand, there are few studies on the migratory impact of ecological restoration projects.
74 However, these projects are concrete policy solutions to climate change (effective or not), and
75 therefore, are likely to lead to new forms of migration.

76

77 **1.2. Migrations in Senegal**

78 International migration plays an important role in adding to the population in metropolises in
79 the developed world, but it only marginally contributes to population redistribution in less
80 developed countries [13]. In Senegal, as in many developing countries, the strongest
81 migration flows are not international, but internal [14,15]. Since the recurrent droughts in the
82 1970s and 1980s and the consequential degradation of the environment, income
83 diversification strategies adopted by the populations have logically resulted in migratory
84 movements [i.e., 16] that are fairly short-term and pendular, and usually internal [5]. In
85 Senegal, nearly 2 million individuals, or 14.6% of the general population, are internal
86 migrants [17]. Dakar is naturally the primary destination for these migrants, as it is the
87 economic and administrative capital of the country. The city alone accounts for 43.6% of
88 internal migrants [9]. But according to Ba and colleagues [5], a high level of migration from

89 one rural area to another is well documented, as is the emergence of urban-rural migration. To
90 our knowledge, however, in Senegal, few studies on internal migration to rural areas have
91 been conducted so far, or they pertain mainly to pendular migrations.

92

93 **1.2.1. Determinants of internal migration**

94 According to Baker and Aina [18], the major causes of internal migration described in the
95 literature are natural and unnatural disasters, unequal development, demographic pressure,
96 low agricultural production, poverty and the lure of cities. In Senegal, economic reasons
97 appear to be one of the major factors for migration. [19]. However, according to Harttgen and
98 Klasen [14], these economic differences offer only a partial explanation of migration patterns.
99 Other determinants of migration must be considered, including climate change, a theme that is
100 becoming increasingly important in the study of migration on the African continent [3]. Most
101 of the studies that provide this quick overview of migration motivations focus on international
102 migration or rural-urban migration. However, Chamberlin and colleagues [20] describe rural
103 migration as a blind spot, despite the potential benefits it could have on local development
104 opportunities.

105

106 **1.2.2. The consequences of internal migration**

107 This overview of studies pertaining to the determinants of internal migration seems to indicate
108 that migrants arriving in their host environment are thus generally people in search of
109 economic opportunities or seeking better social and economic living conditions in a different
110 geographic area. The study of the evolution of these migrants is complex in that it depends at
111 once on their initial demographic, sociological and economic characteristics and opportunities
112 related to the physical, economic and social environment they are immersed in, as well as the
113 political and institutional frameworks of the host milieu.

114 Moreover, as Agyemang and colleagues [21] point out, migration represents a unique
115 opportunity to study the influence of environmental exposure on health. Although a causal
116 relationship cannot be established directly through these studies due to the complexity of the
117 links between migration and health [22], many hypotheses have now been developed to
118 explain changes in health status associated with migration [23]: The "healthy migrant
119 hypothesis," according to which migrants are healthier and have a socio-economic advantage
120 in their home society [e.g., 24,25] is by far the best known. However, this initial health benefit
121 is believed to be lost over time, with prolonged exposure to the new environment, a
122 hypothesis known as the "adaptation effect," or the gradual alignment of migrants' health
123 status on that of their host population [i.e., 26]. On the contrary, the "socialization effect"
124 describes the fact that migrants maintain their initial state of health.

125

126 **1.3. Objectives**

127 As explained above, the general objective of this article is to analyze to what extent the
128 implementation of the project to combat desertification - the Great Green Wall Initiative - is
129 likely to disrupt migratory movements towards the rural environment and, consequently, the
130 socio-economic structures and health status of local populations. To this end, migration to the
131 remote rural municipality of Tessekere (located in the Senegalese Sahel), a pioneering area in
132 the establishment of the Great Green Wall, will be analyzed and its impact on the
133 demographic, economic, social and health situations of the local population will be assessed.

134

135 **2. Material and methods**

136 **2.1. Population sample**

137 To carry out this study, a comprehensive survey was conducted from February to August
138 2015 in the municipality of Tessekere (Ferlo region, northern Senegal). In 2015, according to

139 Senegal's National Agency for Statistics and Demography (ANSD), a total of 8,999
140 individuals were living in Tessekere municipality [27]. The population sample selected for
141 this study comprised 500 individuals aged 20 and over. The sample was constructed using the
142 combined quota method (cross-section by age and gender) to strive for representativeness of
143 the population of Tessekere of the above-mentioned age group. Data from the ANSD dating
144 from the last census (2013) were used. The quota variables used were gender (male/female)
145 and age (20-29 / 30-39 / 40-49 / 50 and over). In practical terms, this method requires
146 constructing a sample that reflects the proportions observed in the general population: for
147 example, according to the last census; 20.6% of the population were women of the age group
148 '20-29'. The sample was constructed to match this proportion by including 103 women aged
149 20 and 29 years of age. The method was the same for each quota by gender, age and place of
150 residence.

151 Eight investigators (PhD students in Sociology, Medicine and Pharmacy) started out from
152 different points each day to interview individuals in Wolof or Haalpulaar in the three villages
153 of the commune of Tèssékéré (Amaly, Widou Thiengoly and Tèssékéré) as well as in the
154 surrounding camps. Investigators had a certain number of individuals to interview (women
155 aged 20-29 / men aged 20-29 / women aged 30-39 / men aged 30-39 / women aged 40-49 /
156 men aged 40-49 / women aged 50 and over / men aged 50 and over) to meet the quotas. Only
157 one person was selected as a respondent in each house (for villages) and each family (for
158 camps). The investigators went into the homes, inquired about the inhabitants and then chose
159 the first person they saw who met the characteristics needed for the quotas. In-person
160 interviews were conducted. They ranged from 30 to 45 minutes, depending on respondent
161 availability and desire to talk.

162

163

164 **2.2. Sociodemographic variables**

165 The socioeconomic and demographic variables collected were:

166 - age (20-29 /30-39 /40-49 /50 and over)

167 - gender (male/female)

168 - occupation (civil servant / artisan, craft worker, trader / livestock breeder / none)

169 - economic conditions: the following question was used as an indicator of economic
170 conditions: “Given your household income, do you feel you ... a) live well? b) live okay? c)
171 live okay, but you have to be careful? d) have difficulty making ends meet?” This question,
172 taken directly from Razafindrakoto and Roubaud’s study, has demonstrated validity and
173 relevance in eight African capitals, including Dakar, to measure economic conditions in the
174 context of subjective well-being [28].

175 - migratory status: migrants were defined as individuals who were not born in the
176 Louga region and were living in the Tessekere municipality for more than one year, in
177 accordance with the definition of ‘internal migrant’ as per Senegal’s National Agency for
178 Statistics and Demography. Three groups were distinguished among the migrant population:
179 the first was made up of individuals born in one of the principal cities (Saint-Louis, Kolda,
180 Louga, Ziguinchor, Tambacounda, Thiès, Diourbel, Fatick, Kaolack and Matam); the second,
181 of individuals born in one of Senegal’s secondary cities (population of 10,000 inhabitants or
182 more according to Geopolis). Last, the third group corresponds to people born in rural
183 Senegal (elsewhere than the Louga region)

184 - for migrants, the length of residence in Tessekere municipality (< 10 years/< 20
185 years/ \geq 20 years)

186 - to analyze internal migration, migrants from foreign countries were removed from the
187 general sample, bringing the total number of individuals to 496.

188

189 **2.3. Psychosocial and health variables**

190 2.3.1. Self-rated health

191 SRH was measured using a questionnaire with five possible answers: “Overall, would you say
192 that your health is: excellent, very good, good, fair or poor?” For the majority of bivariate
193 analyses and multivariate analyses, this variable was dichotomized. In accordance with
194 Jylhä’s [29] remark – “the baseline [that] does not normally need to have a cause” – showing
195 a break between good health and less than good health, the split was made between the
196 answers “excellent,” “very good,” and “good” (scored 1) and the answers “fair” and “poor”
197 (scored 0).

198

199 2.3.2. Perceived stress

200 Perceived Stress Scale [30] was used to measure psychosocial stress in individuals. Six out of
201 the ten items of PSS-10 are considered negative (1, 2, 3, 6, 9, 10) and the remaining four as
202 positive (4, 5, 7, 8), representing perceived helplessness and self-efficacy, respectively. Each
203 item was rated on a five-point Likert-type scale (0 = never to 4 = very often). Total scores are
204 calculated after reversing positive items’ scores and then summing up all scores. Total scores
205 for PSS-10 ranged from 0 to 40. A higher score indicates greater stress.

206

207 **2.4. Statistical analyses**

208 Bivariate and multivariate analyses were used to test associations between dependent and
209 independent variables. Bivariate analyses included Chi² tests. Student’s t test and ANOVAs
210 were used to compare mean stress scores. Logistic regression was then used to assess the
211 extent to which the various factors assessed predicted good self-rated health. The software
212 used for the statistical analysis was IBM SPSS Statistics 22.

213

214 **3. Results and discussion**

215 **3.1. Migration and its sociodemographic and economic consequences**

216 The results of this study show that the population of internal migrants living in the
217 municipality of Tessekere is extremely high in terms of demographic weight. While ANSD
218 gives an average of 3.4% of internal migrants in the region [9], our representative sample of
219 the population has 13.4%. This particularly high level of internal migration in one of
220 Senegal's most isolated municipalities is more than likely linked to implementation of the
221 Great Green Wall project as of 2008. In fact, although migrants do not differ significantly
222 from the natives of the Louga region in terms of age and gender distribution, they are more
223 often civil servants, artisans, craft workers or traders. To carry out the Great Green Wall
224 project, the National Agency of the Great Green Wall in Senegal employs many agents, living
225 and working in the area throughout the year [31]. Thus, a whole crew of nursery workers,
226 drivers, mechanics, horticulturists and laborers form a segment of the population that
227 previously did not inhabit this region. These workers, who are state employees, are more often
228 from Senegal's secondary and principal cities, which explains why the distribution of migrants
229 by geographical origin and in particular the large proportion of people from the main and
230 secondary cities (more than half of the migrants: 56.72%). The privileged situation of these
231 migrants certainly explains why they have a higher level of material well-being than other
232 people from this region (more often herders) and migrants from rural areas (more often
233 artisans, craft workers and traders). Finally, regardless of their migratory status (secondary
234 town, main towns or rural areas), migrants have mostly settled in the municipality for less
235 than 10 years (49.2% of internal migrants), i.e. since the beginning of the Great Green Wall
236 project.

237 It is therefore undeniable that the implementation of the Pan-African Great Green Wall
238 project, while it does not fundamentally change the age and gender structure of the population

239 of the municipality of Tessekere, does change its socio-economic structure. Thus, the GGW
240 development project leads to the creation of an original population profile, clearly distinct
241 from the general population of the region. This result can be compared to that obtained by
242 Chamberlin and colleagues [20], because migration to the municipality of Tessekere mainly
243 brings in individuals holding wage-earning jobs (especially civil servants) and non-
244 agricultural jobs (artisans, craft workers or traders), who report a good level of material well-
245 being. In such conditions, migration to rural areas (from urban or rural areas), far from being
246 an act of desperation, would appear to be experienced more as an opportunity, both for the
247 local populations – who thus benefit from an injection of cash in the local economy – and for
248 the migrants themselves.

249

250 **Table 1 : Socio-demographic and economic characteristics of the general sample by migration status (N=496)**

Variables	Categories	Natives		Secondary cities		Principal cities		Rural area*		Total		Test
		N	%	N	%	N	%	N	%	N	%	
Sex	Men	210	48,50	11	42,31	6	50,00	11	44,00	238	47,98	$\chi^2 = 0,560$ p = 0,905
	Women	223	51,50	15	57,69	6	50,00	14	56,00	258	52,02	
Age	< 50 years	348	80,37	23	88,46	9	75,00	20	80,00	400	80,65	$\chi^2 = 1,290$ p = 0,731
	≥ 50 years	85	19,63	3	11,54	3	25,00	5	20,00	96	19,35	
Occupation	Civil servant	20	4,62	2	7,69	3	25,00	1	4,00	26	5,24	$\chi^2 = 39,321$ p < 0,001
	Artisans, small merchants	121	27,94	14	53,85	6	50,00	15	60,00	156	31,45	
	None	133	30,72	9	34,62	0	0,00	6	24,00	148	29,84	
	Herder	159	36,72	1	3,85	3	25,00	3	12,00	166	33,47	
Lenght of residence	< 10 years			14	53,85	5	41,67	12	48,00	31	6,25	$\chi^2 = 0,334$ p = 0,846
	< 20 years			6	23,08	2	16,67	5	20,00	13	2,62	
	≥ 20 years			6	23,08	5	41,67	8	32,00	19	3,83	
Material well-being	Have difficulty making ends meet	62	14,32	5	19,23	5	41,67	1	4,00	73	14,72	$\chi^2 = 19,129$ p = 0,024
	Live ok but have to be careful	140	32,33	7	26,92	2	16,67	7	28,00	156	31,45	
	Live ok	181	41,80	9	34,62	3	25,00	17	68,00	210	42,34	
	Live well	50	11,55	5	19,23	2	16,67	0	0,00	57	11,49	
Total		433	100,00	26	100,00	12	100,00	25	100,00	496	100,00	

251 *other than Louga region

252

3.2. Self-rated health and migrations

From a general point of view, self-rated health in the Tessekere municipality appears to be linked to gender, age, material well-being and stress. Controlling the relationship between self-rated health and migration by other potentially health-related variables shows that women (OR = 0.624; $p < 0.005$), people over 50 years of age (OR = 0.191; $p < 0.001$), those who are stressed (OR = 0.922; $p < 0.001$) and those reporting poor material well-being (OR = 0.313; $p < 0.005$) are more likely to report poor health, all other things being equal. The link between occupation and self-rated health initially described in the bivariate analyses (table 2) disappears in the logistic regression (table 3).

The fact that women and older people report poor health more often than men and younger people has been described many times in African and European populations [32-35], as has the relation between material well-being and self-rated health in Tessekere municipality [32]. As Darviri and colleagues [35] have shown, stress is also a major variable to consider since it is closely linked to self-rated health and, therefore, to short-term and long-term mortality [36]. Moreover, specifically with regard to migration, it should be noted that the results of logistical regressions performed have shown that individuals' migratory status mattered little: whether born in a secondary city, main city or rural area, people showed the same likelihood to self-rate their health positively or negatively. On the other hand, when length of residence in the Tessekere municipality is factored in, it appears that migrants who have settled in the Tessekere municipality for less than 10 years are significantly more likely to consider themselves in good health (OR = 3.349; $p < 0.05$), regardless of age, sex, occupation, stress level or material well-being. It is therefore the length of residence in the new environment that influences the way in which migrants rate their health, rather than their geographic origin. Thus, the "healthy migrant hypothesis," studied extensively in research pertaining to relations between migration and health, seems to be borne out for rural-bound internal migrants. Self-

278 assessment of health among migrants therefore remains better than among the local
279 population during the first 10 years of settlement, but it diminishes over time with the length
280 of their stay. This result also indicates that, in addition to the economic aspect, which
281 obviously influences migrant health status (knowledge and attitudes towards disease, access
282 to health care, etc.), health is also environment-dependent. In this case, it is the "adaptation
283 effect" hypothesis (also called "assimilation effect") that appears to be verified by this study.
284 Indeed, after about ten years, levels of self-rated health gradually converge, while migrants'
285 self-rated health is initially far better. Given that almost half of the migrants settled in the
286 municipality of Tessekere less than ten years ago, it is likely that migration not only changes
287 the socio-economic structure of the population, but also its health status.
288

Table 2: Socio-demographic, economic and psychosocial related characteristics of the general sample by self-rated health (N=496)

Variables	Categories	Very poor/Poor		Good/very good/excellent		Total		Test
		N	%	N	%	N	%	
Sex	Men	86	40,19	152	53,90	238	47,98	$\chi^2 = 9,168$ p = 0,002
	Women	128	59,81	130	46,10	258	52,02	
Age	< 50 years	146	68,22	254	90,07	400	80,65	$\chi^2 = 37,203$ p < 0,001
	≥ 50 years	68	31,78	28	9,93	96	19,35	
Occupation	Civil servant	7	3,27	19	6,74	26	5,24	$\chi^2 = 12,401$ p = 0,006
	Artisans, small merchants	58	27,10	98	34,75	156	31,45	
	None	80	37,38	68	24,11	148	29,84	
	Herder	69	32,24	97	34,40	166	33,47	
Migration status	Natives	192	89,72	241	85,46	433	87,30	$\chi^2 = 3,372$ p = 0,338
	Secondary cities	8	3,74	18	6,38	26	5,24	
	Principal cities	6	2,80	6	2,13	12	2,42	
	Rural area	8	3,74	17	6,03	25	5,04	
Lenght of residence	< 10 years	5	2,34	26	9,22	31	6,25	$\chi^2 = 12,695$ p = 0,005
	< 20 years	5	2,34	8	2,84	13	2,62	
	≥ 20 years	12	5,61	7	2,48	19	3,83	
	Natives	192	89,72	241	85,46	433	87,30	
Stress		18,55 ± 5,834		15,77 ± 5,812		16,97 ± 5,977		t = 5,278; p < 0,001
Material well-being	Have difficulty making ends meet	51	23,83	22	7,80	73	14,72	$\chi^2 = 28,296$ p < 0,001
	Live ok but have to be careful	52	24,30	104	36,88	156	31,45	
	Live ok	90	42,06	120	42,55	210	42,34	
	Live well	21	9,81	36	12,77	57	11,49	
Total		214	100,00	282	100,00	496	100,00	

Table 3: Adjusted odds ratio (OR) for excellent/very good/good self-rated health (N = 496)

Variables	Categories	p	Odds Ratios	CI for OR (95%)	p	Odds Ratios	CI for OR (95%)
Sex (Men)	Women	0,040*	0,624	0,398 - 0,979	0,039*	0,619	0,392 - 0,975
Age (< 50 years)	≥ 50 years	< 0.001***	0,191	0,112 - 0,326	< 0.001***	0,214	0,124 - 0,368
Occupation (Herder)	Civil servant	0,663	1,262	0,442 - 3,606	0,777	1,162	0,410 - 3,295
	Artisans, small merchants	0,136	1,494	0,881 - 2,534	0,157	1,467	0,863 - 2,491
	None	0,108	0,634	0,363 - 1,105	0,121	0,644	0,369 - 1,123
Material well-being (Live well)	Have difficulty making ends meet	0,006**	0,313	0,136 - 0,722	0,008**	0,320	0,138 - 0,743
	Live ok but have to be careful	0,447	1,318	0,647 - 2,683	0,396	1,359	0,669 - 2,763
	Live ok	0,507	0,797	0,408 - 1,557	0,586	0,831	0,427 - 1,616
Stress	Continuous	< 0.001***	0,922	0,889 - 0,957	< 0.001***	0,919	0,886 - 0,954
Migration status (Natives)	Secondary cities	0,453	0,699	0,275 - 1,780			
	Principal cities	0,700	1,296	0,347 - 4,846			
	Rural area	0,583	0,644	0,134 - 3,093			
Lenght of residence (Natives)	< 10 years				0,026*	3,349	1,152 - 9,734
	< 20 years				0,796	1,174	0,347 - 3,972
	≥ 20 years				0,392	0,628	0,216 - 7,825

*p < 0.05

**p < 0.01

***p < 0.001

1 Finally, the Great Green Wall project, although it is now 10 years old, is at a very early stage
2 in many participating countries, mainly because of significant geopolitical difficulties.
3 Moreover, as pointed out earlier, migration to rural areas remains little studied, especially in
4 developing countries. This is why, as far as authors know, no study has been carried out on
5 the relationship between the Great Green Wall project in Africa, the health of the populations
6 living there and the migrations linked and/or induced by this development project. The
7 original results obtained during this study are the first to highlight the fact that the Great
8 Green Wall project, as conceived and implemented in Senegal, has implications that go far
9 beyond the fight against desertification or the development of local terroirs.

10

11 This study has several limitations. A principal limitation is its cross-sectional design, which
12 does not permit longitudinal measurement to examine how self-rated health evolves over time
13 in relation to migration. Moreover, despite the large size of the population sample (compared
14 to the general population of the commune of Téssékéré), the number of migrants present in
15 our sample is small, and the results obtained must be interpreted with caution. Finally, it is
16 obvious that the rural environment studied here cannot be compared to other rural areas in
17 Senegal: indeed, the presence of the Great Green Wall, as a development project,
18 distinguishes this rural environment from the rest of the region. However, it should be noted
19 that many development projects are located in rural Senegal (more than 30 projects for the
20 Agence Française de Développement, for example), and most certainly modify the population
21 and socio-economic structures of these areas.

22

23 **4. Conclusions**

24 The overall aim of this study was to analyze migration to an isolated rural area: the
25 municipality of Tessekere in Senegal. The results have enabled us to outline a chain of events

26 that explain the unusual population profile of this municipality in the Sahel. First, the
27 desertification process underway in Sahelian ecosystems since the 1970s prompted eleven
28 African countries to develop the Great Green Wall for the Sahara and the Sahel Initiative in
29 2005. Three years later, the GGW Agency in Senegal was created and actions were
30 undertaken at the local level (particularly in the municipality of Tessekere). From that point
31 on, the arrival and installation of staff dedicated to the Great Green Wall (including state
32 employees) began. This situation has now led to a transformation of the population structure:
33 migration to this isolated rural municipality is more important than in the rest of the Louga
34 region (often providing migrants). The socio-economic and health situation of the
35 municipality of Tessekere is also affected by this internal migration. It increases the
36 proportion of individuals living in the municipality who enjoy a good level of material well-
37 being. It also increases the proportion of individuals reporting good self-rated health. In short,
38 an environmental requirement (combating desertification), addressed by an international
39 project - the Great Green Wall - and then applied at the national level, has transformed the
40 demographic, economic and health structure of a local population.

41 In conclusion, our study showed that (1) an examination of migration can offer a means of
42 interpreting the impact of development projects and the local changes they entail, and (2)
43 migration is a unique prism through which one can study how exposure to a new physical and
44 social environment influences the health of populations.

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