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## MUTUALLY REINFORCING CRISES AND SUSTAINABLE DEVELOPMENT – LESSONS FROM RURAL NIGER

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**Abstract**

*The Republic of Niger is facing crises that are mutually reinforcing: climate crises, inflation, debt crises and deglobalisation, which are hitting rural areas particularly hard. Rural development – a key issue of sustainable development - in Niger is linked to thirteen UN SDGs. A household survey was organised to assess the socio-environmental-economic conditions of a small village in rural Niger. Twenty percent of the households are smallholders, 15% large farmers, one household is nomadic, and 62% subsistence farmers. The household survey also provides information on the structure of agricultural production in different households, energy and water consumption, and the impact of climate change on living conditions. The results of these household survey will be mapped against the rural SDGs, their targets, and indicators to provide a holistic picture of sustainable rural development in West Africa, using the example of rural Niger. The lessons from rural Niger can be applied not only to West Africa, but to all developing countries facing similar challenges, especially in rural areas.*

**Keywords:** Rural Economics, Household Survey, SDGs

## 1. INTRODUCTION

The Republic of Niger is faced with crises that are mutually reinforcing: World Weather Attribution (WWA) analysed the climate situation in the Sahel region of West Africa in 2024 and concluded that the heatwave was mainly caused by climate change (World Weather Attribution, 2024), with record temperatures also recorded in Niger (Clair Barnes et al., 2024). Climate change also affects food security in West Africa (Beltran-Peña and D'Odorico, 2022). The Famine Early Warning Systems Network (FEWS NET) monitors the development of food prices and the problems of access to food in West Africa. The network concludes that food prices are rising significantly in Niger (Famine Early Warning Systems Network, 2024). According to the IMF's 2023 Global Debt Database (IMF, 2024): Debt has increased by about \$200 billion to \$235 trillion compared to 2021 (Vitor Gaspar, 2023). This crisis hits the world's poorest countries the hardest (Romeu, 2024), as Rafael Romeu put it. The situation in Niger has deteriorated from a slightly critical situation in 2021 to a critical level in 2023 (Misereor e.V., 2023).

The threat of climate change, rising food prices due to the war in Ukraine (Leal Filho et al., 2023) and the debt crisis are creating a new fragmentation of the global community (Münkler, 2023), making it harder for Niger to generate higher export revenues to pay off debt and invest in climate change mitigation (Friedrich-Ebert-Stiftung, 2024, IMF BLOG, 2023, IMF Blog -The Editors, 2023).

## West Africa's growing restrictions

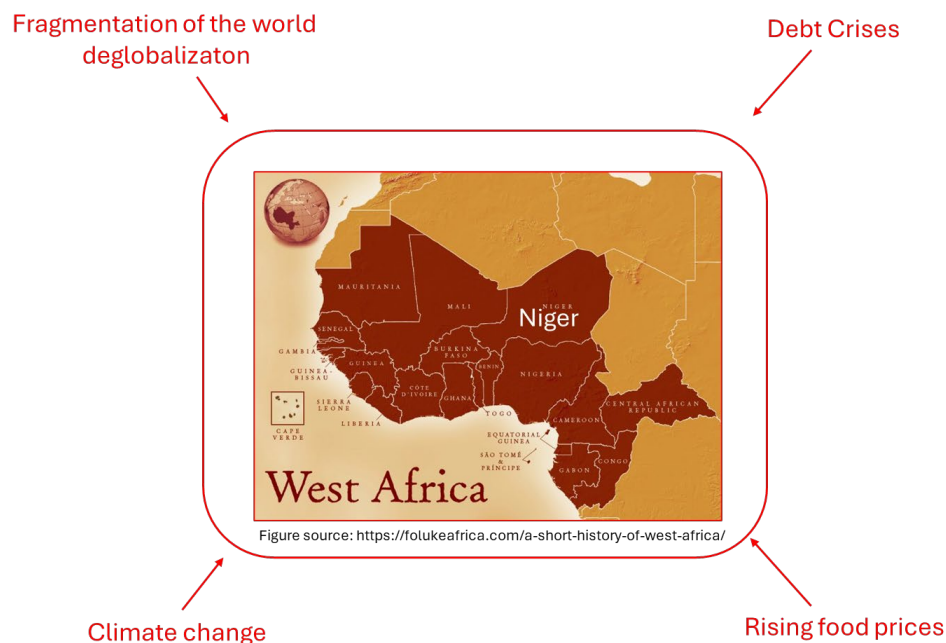


Figure 1 Four crisis

These four crises (Figure 1) reinforce each other and exert socio-economic and environmental pressure on communities in West Africa, particularly in the rural areas.

## 2. EMPIRICAL METHODOLOGY

To get a first picture of the impact of the crises on the socio-environmental-economic conditions in rural Niger a household survey was conducted in a small village.

“A household survey is a questionnaire distributed to a sample of households in a population, allowing interviewers to gather information from respondents (AI generated definition of ScienceDirect based on International Encyclopaedia of the Social & Behavioral Sciences, 2001).<sup>1</sup>”

As the demand for data increases, especially for rural areas, household surveys are needed, for example, to monitor social indicators such as the SDGs, to obtain information on progress or lack of progress towards sustainable development (Alkire, 2014). The usage of household surveys in research began after the Second World War with studies about consumer behaviour (Stigler, 1954) and developed to “one of the main innovations in social science research of the last century (Meyer et al., 2015).” A detailed description of the various household survey methods are found by Angus Deaton in his book “The analysis of household surveys” (Deaton, 2018).

A household is in this context defined

“as a housekeeping unit or, operationally, as a social unit: having common arrangements; sharing household expenses or daily needs; in a shared common residence. A household includes either one person living alone or a group of people, not necessarily related, living at the same address with common housekeeping, i.e. sharing at least one meal per day or sharing a living or sitting room (Eurostat, 2025).”

And a household is defined in a broader sense as a family that is related by blood or by marriage (parents and children) (World Bank Lecture, 2016). Hence, a household is an economic unit (Wied-Nebbeling and Schott, 2007) that makes consumption decisions according to its joint preferences (Sibylle Brunner, 2014).

## 3. LITERATURE REVIEW

For M. Aliber, household surveys are a “source of information” on, for example, the level of food security in the household (Aliber, 2009). He detected a lower food expenditure per capita in rural areas of South Africa (Aliber, 2009). Kojima et al analysis household expenditure surveys since 2008 in 22 sub-Saharan African countries (Kojima, 2016). Their research shows that a third of all people use electricity, but the users are disproportionately distributed between urban and rural areas (Kojima, 2016). The lack of affordability is the most important barrier to the connection of households to the electricity grid (Kojima, 2016). Ken Miyajima analyses the mobile phone ownership in South Africa, also using household survey data (Miyajima, 2022). Meanwhile, Karen Bailey et al. use household survey data in southern Africa to identify areas where natural resources can be collected (Bailey et al., 2020). The aim of the research is to better understand how human and ecological processes relate to each other (Bailey et al., 2020). The United Nations Sustainable Development Goals one and seven aim to reduce poverty in general and energy poverty in particular and therefore A. Kouandou (Kouandou, 2025) used household survey data to analyse the role of migrant bank transfers - an important source of household income - in developing a clean energy system in West Africa.

Mensah et al. use household survey data to analyse the importance of ecosystem services to local communities in South Africa (Mensah et al., 2017). Assaad et al. quantifying the extent of inequality of opportunity in the Middle East and North Africa using household survey data (Assaad et al., 2019).

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<sup>1</sup> <https://www.sciencedirect.com/topics/social-sciences/household-survey>

The literature review has shown that household surveys in Africa provide national, regional and local data for the analysis of African economic development. (Randall and Coast, 2016, Jerven and Johnston, 2016). The importance of household survey data for research, particularly in rural areas, is also highlighted in the literature review. The household survey-based analysis presented below builds on the work of Kouandou on the UN SDGs and Mensah on rural communities. The broader analysis presented here focuses on six UN SDGs to better understand the impact of the four crises on rural development.

#### 4. UN SDGS FOR RURAL NIGER

Rural development plays a leading role in the UN concept of sustainable development, which is summarised in the UN SDGs (United Nations, 2015). The UN World Social Report (United Nations Department of Economic and Social Affairs, 2021) calls for rural development to be considered as a key issue for sustainable development. Rural development in Niger is directly linked to 13 UN SDGs as Figure 2 shows (United Nations, 2015): SDG 1 'No Poverty', SDG 2 'Zero Hunger', SDG 3 'Good Health and Well-Being', SDG 4 'Quality Education', SDG 6 'Clean Water and Sanitation', SDG 7 'Clean Energy', SDG 8 'Decent Work and Economic Growth', SDG 9 'Resilient infrastructure', SDG 10 'Reduced Inequalities', SDG 11 'Sustainable Cities and Communities', SDG 13 'Climate Action', SDG 15 'Life on Land', SDG 16 'Peace, Justice and Strong Institutions'.



Figure 2 SDGs for measuring sustainable rural development in rural areas

As well as determining the SDGs and highlighting the importance of sustainable rural development, the UN has also defined sustainability targets for each SDG and sustainability indicators that can be used to measure these targets and define progress towards sustainability goals, as shown in Table 1.

Table 1 UN SDGs, targets, and indicators for rural Niger

UN SDGs, targets and indicators for rural Niger		
SDG Number	Target	Indicator
SDG 1 'No Poverty'	Not living on less than \$ 1.24 a day	Proportion of population living below international poverty line 1.25 \$
	Reduce people living in poverty	Proportion of population living below national poverty line
	Social protection system for the poor and vulnerable	Proportion of population covered by social protection
	Equal rights to economic resources (microfinance)	Proportion of population in households with access to basic services
	Resilience for the poor and vulnerable (reduce exposure to climate extrem events)	Direct economic loss to disasters
SDG 2 'End Hunger'	End hunger, ensure sufficient food all year round	Undernourishment
	No malnutrition	Prevalence of malnutrition
	Double the agricultural productivity and income of small-scale food producer	Average income of small-scale food producers
	Sustainable food production	Proportion of sustainable agriculture
SDG 3 'Health'	Access to quality essential health-care services	Essential health services
	Reduce illnesses from water pollution	Mortality rate attribute to unsafe water
SDG 4 'Education'	Ensure equitable and quality primary and secondary education	Completion rate
SDG 5 'Gender equality'	Women equal rights to economic resources	Share of women among owners of agricultural land
SDG 6 'Water and Sanitation'	Access to safe and affordable drinking water for all	Proportion of population using safe drinking water
	Access to adequate and equitable sanitation	Proportion of population using safe sanitation
	Improve water quality	Wastewater management
	Water-use efficiency	Water bodies with good water quality
	Water resource management	Integrated water resource management
	International cooperation and capacity-building	Development assistance
SDG 7 'Energy'	Ensure access to affordable, reliable and modern energy services	Proportion of population with access to electricity
	Increase share of renewable energy	Proportion of population with reliance on clean tech
	Double improvement in energy efficiency	Renewable energy share in final energy consum
	International cooperation for clean energy	Energy intensity (E/GDP)
	Expand energy infrastructure	International financial flows to developing countries
SDG 8 'Decent work'		Installed renewable energy capacity
	Higher level of economic productivity	Annual growth rate of real GDP (village income)
	Decent jobs	Informal employment
SDG 9 'Resilient infrastructure'	Child labor	Proportion and number of children (5-17 age)
	Sustainable and resilient infrastructure	Proportion of rural population who live within 2 km of an all-season road
SDG 10 'Reduce inequality'	Financial support of African countries for resilient infrastructure	Official international support to infrastructure
	Sustain income growth of the bottom 40 percent of population	Growth rates of household expenditures / income
SDG 11 'Sustainable Cities'	Inclusive growth	Proportion of people living below 50% of median income
	Public transport	Access to public transport
SDG 13 'Climate Change'	Victims of natural disasters	Economic loss attributed to disasters
	Strengthen resilience	Local disaster risk reduction strategies
SDG 15 'Life on Land'	Climate change measures	Greenhouse gas emissions
	Combat desertification	Proportion of land that is degraded
SDG 16 'Peace, Justice'	Develop effective, accountable and transparent institutions at all levels	Proportion of population satisfied with their last experience of public services

Source: United Nations, 2025

To analyse SDG 1 'No poverty', we have selected five indicators to measure rural development towards no poverty. Four indicators are used to describe whether the rural development is making progress towards the goal of ending hunger as required by SDG 2. Basic health services and safe drinking water are essential to achieving SDG 3. The goal of equitable and quality primary and secondary education is used to measure progress towards good educational conditions, as required by SDG 4. In Niger, the indicator of women's share of agricultural land ownership is used to measure progress towards gender equality (SDG 5) in rural areas. SD Goal 6 water and sanitation can be described by six sustainability targets and six indicators. SDG 7 on energy is characterised by six indicators, while SDG 8 on decent work is characterised by only three indicators. The resilient infrastructure required by SDG 9 can be characterised by two indicators, while SDG 10 is described by two indicators that measure levels of inequality. Sustainable cities, SDG 11, can be analysed using two indicators. SDG 13, the goal on the state of climate change, can be analysed through two indicators. Life on land (SDG 15) includes an indicator on land degradation in the fight against desertification. The goal of peace and justice (SDG 16) depends on effective institutions, and one indicator measures people's experience of the public service and its institutions. Against this background of sustainability, the socio-economic situation in rural Niger will be analysed.



## 5. HOUSEHOLD SURVEY: SOCIOECONOMIC STRUCTURE OF DAR ES SALAM

Against the backdrop of the challenges described and the UN SDG targets, a quick interim household survey (Alkire, 2014) was conducted to assess the socio-environmental and economic conditions of a small village in rural Niger. The household survey will provide information on the structure of agricultural production in different households, energy and water consumption, and the impact of climate change on living conditions. These household survey results will be mapped to the rural SDGs, their targets, and indicators to provide a holistic picture of rural sustainable development in West Africa using the example of Niger. The lessons from rural Niger are applicable not only to West Africa, but to all developing countries facing similar challenges, especially in rural areas.

### 5.1. Environment

Dar Es Salam is a small village in the Boboye district of the Dosso region (Figure 3). The village is 80 km outside of Niamey. Dar Es Salaam is inhabited by two tribes, a sedentary tribe and a nomadic tribe that moves with their animals to graze (Figure 4). The region of Dar Es Salam and the village itself are shown in the following two pictures (Source: Google Earth).



Figure 3 Region Dar Es Salam



Figure 4 Village Dar Es Salam

Source: Google Earth.

### 5.2. Households

To analyse rural living conditions in the Dosso region of Niger, a household survey was conducted in Dar es Salaam in November 2021. A quarter of the four hundred households took part in the survey. The survey found that almost two-thirds of households are subsistence farmers and only one-third can sell their produce on the local market or in Niamey. Most households (57%) have less than 0.5 hectares of land to grow crops for their needs, and 43% can grow their crops on more than 0.5 hectares.

### 5.3. Household Income and savings (SDG 1 no poverty, SDG 10 reduced inequalities)

The household can earn a maximum annual income of 85,600 CFA or \$=1.13/day in international \$<sup>2</sup>, based on its agricultural activities (Schlör and Kuckshinrichs, 2023). The inhabitants of Dar Es Salam live in extreme poverty, as described in SDG 1, because the threshold of extreme poverty is 258 CFA or 1.25 international \$ per day (International Monetary Fund (IMF), 2025) and violates SDG 1 target. Given this extreme poverty, it is not surprising that 87% of households have no savings. As 62% of households are subsistence farmers, the income earned does not fully reflect the economic

<sup>2</sup> THE WORLD BANK. 2025. *What is an "international dollar"?* [Online]. The World Bank. Available: <https://datahelpdesk.worldbank.org/knowledgebase/articles/114944-what-is-an-international-dollar> [Accessed January, 31 2025].

situation in Dar Es Salam. To get a more nuanced picture of the socio-economic situation of the village, we estimate the value of agricultural production of the households as an approximation of the annual virtual income, not measured in monetary units, but in terms of the agricultural products produced by the households and valued at their Niger market prices.

Table 2 virtual income

### Annual virtual income distribution Dar Es Salam - surveyed households

Agricultural production value of the households as an approximation value for their annual income		
Income classes in \$	Number of households	in %
<667	2	2%
668-1333	12	13%
1334-2667	38	40%
2668-4000	20	21%
4001-6666	14	15%
>6667	8	9%
All households	94	100%

Source: Own calculation, 2025 based on TUM-FZJ Survey, 2021

Table 2 shows six income classes for households in Dar Es Salam: 2% of households belong to the lowest income group, 13% have a virtual annual income between \$668 and \$1333, 40% of households have an income between \$1334 and \$2667, 21% between \$2668 and \$4000, 15% between \$4001 and \$6667, and 9% of households have a virtual income of more than \$6667. The survey shows that 9% of households have ten times more income than the two households in the lowest income group. This virtual income is based on village food production.

## 5.4. Food production (SDG 2, SDG 15)

The household survey shows that the households of Dar Es Salam produce millet, sorghum, cowpeas, peanuts, and salads and green vegetables (Table 3).

Table 3 Agricultural production

Agricultural production of the surveyed households in kg				
	per household	surveyed	all households	Price CFA/kg
Millet	373	36,935	147,740	250-300
Sorghum	25	2,509	10,036	200-300
Cowpeas	63	6,276	25,104	350-500
Peanuts	177	17,550	70,200	150-174
Salads and green vegetables	1	127	508	450-1000
Sesam				420-450
Sum		63,397	253,588	

Source: Own calculation, 2025 based on household survey 2021

The surveyed households produce 36,935 tonnes of millet, 2.5 tonnes of sorghum, 6.3 tonnes of cowpea and 17.5 tonnes of peanuts per year. The production of salads and green vegetables is much lower: 0.127 tonnes. All four hundred households in Dar Es Salam produce 253 tonnes of agricultural produce each year. SDG 2 aims to double the agricultural productivity and income of small-scale food producers, such as the farmers in Dar Es Salam. The following table shows the estimated value of crop production in Dar Es Salam and the theoretical annual household income, assuming that all crops are sold on the market and not consumed by the household.

Table 4 Production value

## Estimated production value of village agriculture

	Village (CFA)	Village in €	per household in €
Millet	177,288,000	272751	682
Sorghum	12,043,200	18528	46
Cowpeas	40,166,400	61794	154
Peanuts	47,736,000	73440	184
Salads and green vegetables	1,422,400	2188	5
<b>Total</b>	<b>278,656,000</b>	<b>428,702</b>	<b>1072</b>

Source: Own calculation, 2025 based on household survey 2021

Table 4 shows that the households produce millet with a production value of € 272,751 per year. The production value of sorghum is €18,528, that of peanuts €73,440 and that of green vegetables €2,188. This gives a total value of agricultural production of € 428,702. The average household achieves a production value of € 1,072 per year or € 2.93 per day. This amount leaves no financial room for investment to double agricultural productivity, as required by SDG 2.

### 5.5. Energy consumption (SDG 7 energy)

SDG 7 calls for access to modern energy services, but in Niger only 11% of households have access to electricity (2015), with 50% of urban households having access to electricity (Kuckshinrichs et al., 2025). In rural areas, less than 1% have regular access to electricity (Gado, 2015). Dar Es Salam is not connected to the electricity grid and only sixteen households surveyed have permanent access to electricity and more than 90% of the households use firewood for cooking (Schlör and Kuckshinrichs, 2023). Besides cooking, lighting the house is another need for electricity. The household survey revealed that 40% of households use torches, 3% use kerosene lamps and 57% use electricity from solar panels, as shown in Table 5 below.

Table 5 Lighting energy

## How do you meet lighting energy demand at home?\*)

	households	in %
Torchlight (dry cell battery)	43	40%
Kerosene lamp	3	3%
Electricity (e.g. from solar panels)	61	57%
	107	100%

\*) households using more than one lighting energy source

Source: Own calculation, 2025 based on TUM-FZJ Survey, 2021,

Dar Es Salam has no permanent access to affordable, reliable, and modern renewable energy services as demanded by SDG 7.

### 5.6. Climate Change (SDG 13 climate change)

Households in Dar Es Salam are suffering from climate change, as shown in Table 6 below.



Table 6 Climate Change

Climate Change in Dar Es Salam - Change of rainfall		
	Surveyed households	in %
Yes, it rains lately more	7	7%
Yes, it rains lately less	83	85%
Not a real difference	8	8%
Total	98	100%

Source: Own calculations, 2025, based on 2021

Eighty-five per cent of household's report that the rainy season is no longer predictable and that it rains less. Chaotic weather conditions make farming difficult. Dar Es Salam is also suffering from the worsening climate change.

### 5.7. Water consumption (SDG 6 clean water)

The Dar Es Salam household survey revealed the structure of water consumption in the village. The villagers use four options to get the water they need as Table 7 shows. They can use bore wells, hand pumps, the public tap, and the community well but they do not buy water jars.

Table 7 Source of water

Source of water in Dar Es Salam	
	Number of households
Bore well	13
Hand Pump	20
Public tap	56
Community well	11
Buy water jars	0
Total	100

Source: Own calculation, 2025 based on survey 2021

Table 7 shows that not all households have permanent access to a safe and affordable water supply as required by SDG 6. The next question is how much water the households consume from various sources in Dar Es Salam. Table 8 shows that all households of Dar Es Salam consume 85,760 litres of water per day.

Table 8 20-litre canister water consumption

20-litre-canister water consumption of surveyed households					
Number of households surveyed	Amount of canister per day	in litre per day	litre per household	All Villagers Water Costs per day in €	Costs per day CFA
	1				
1	2	40	40	0.07	45.8
1	3	60	60	0.11	72.0
1	4	80	80	0.14	91.7
2	5	200	100	0.36	235.7
-	6				
3	7	420	140	0.76	497.7
1	8	160	160	0.29	189.9
2	9	360	180	0.65	425.6
25	10	5000	200	9.00	589.3
63	10+	15120	420	27.22	17824.0
All households		85760	214	38.6	19644.4
Water consumption spread of the village between highest and lowest consumption			10.5		
Average household water costs per day				0.10	49.1

Source: Own calculation, 2025 based on survey 2021

Village water needs per year in litre 31,302,400

The water consumption spread – the difference between the highest and the lowest water consumption – shows is 10.5. Households with the highest water consumption use ten times more water than the households with the lowest water consumption. In summary, the village needs 31,302,400 litres of water per year. Based on this analysis, the daily cost of water is €0.1 per day per household. Table 9 shows that households in Dar Es Salam consume 21360 litres of drinking water per day.

Table 9 Drinking water consumption

Drinking water consumption and needs of surveyed households				
Number of households surveyed	Amount of canister per day	in litre per day	litre per households	All Villagers Water Costs per day in €
15	1	300	20	6
18	2	720	40	14.4
14	3	840	60	16.8
7	4	560	80	11.2
5	5	500	100	10.0
3	6	360	120	7.2
0	7			0
1	8	160	160	3.2
0	9			0
5	10	1000	200	20.0
5	10+	1200	240	24
All 400 households		21360	214	107

Source: Own calculation, 2025 based on survey 2021

per household member

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The average household in Dar Es Salaam consumes 214 litres of water per day, or thirty-nine litres per household member. Eighty-eight villagers consider the drinking water to be safe, and twelve households say they do not trust the drinking water; they do not think it is safe. Table 10 shows the costs that households have to bear for the consumption of water.

Table 10 water costs

Water consumption costs	
Price for canister (20 litre) of water	
Price in €	Number of households
0 – 0.1	76
0.1 - 0.5	4
0.5 - 1	1
> 1	-
Daily expenditures for water in €	
Prices in €	Number of households
0 – 0.1	13
0.1 - 0.5	68
0.5 - 1	1
> 1	1

Source: Own calculation, 2025

The villagers told us that they pay less than €0.1 per twenty litres of water. Four households pay between €0.1 and €0.5 for one canister and one household stated that the cost of water was more than € 0.5 for one 20-l-canister. To summarise, thirteen households have a daily water expenditure of less than €0.1 per day. Sixty-eight households have water costs between €0.1 and €0.5 per day and two households have water costs of more than €0.5 per day. Households also use water for cooking, washing, bathing and other activities, as shown in Table 11.

Table 11 Other water consumption

Other Water consumption (Cooking, Washing, Bathing, others) surveyed 99 households					
	Number of households surveyed	Amount of canister per day	in litre per day	litre per households	All Villagers Water Costs per day in €
27.3%	73	1	1460	20	29.2
29.2%	78	2	3120	40	62.4
20.6%	55	3	3300	60	66
12.4%	33	4	2640	80	52.8
7.1%	19	5	1900	100	38.0
2.6%	7	6	840	120	16.8
0.0%	0	7			0
0.0%	0	8			0
0.0%	0	9			0
0.4%	1	10	20	20	0.4
0.4%	1	10+	25	25	1
100.0%	267				
All 400 households			47380	474	237
Source: Own calculation, 2025 based on survey 2021			per household member	86	

The survey of the ninety-nine households shows that seventy-three households use only one canister of water per day for cooking, washing, and bathing. Seventy-eight households use two canisters, i.e. 56% of households use only 1-2 canisters of water per day for cooking, washing, and bathing, and only two households use ten or more canisters of water per day. The virtual income situation of households in Dar Es Salaam depends on how much water they can use for their agricultural needs (irrigation, livestock, business) (Table 12).

Table 12 Agricultural water consumption

Agricultural Water consumption (irrigation, livestock, business) surveyed households					
	Number of households surveyed	Amount of canister per day	in litre per day	litre per households	All Villagers Water Costs per day in €
20%	36	1	720	20	14.4
17%	32	2	1280	40	25.6
10%	18	3	1080	60	21.6
12%	22	4	1760	80	35.2
13%	23	5	2300	100	46.0
7%	13	6	1560	120	31.2
0%	0	7			0
1%	1	8	160	160	3.2
1%	2	9	360	180	7.2
8%	14	10	2800	200	56.0
12%	22	10+	5280	240	106
100%	183				
All 400 households			66320	663	332
Source: Own calculation, 2025 based on survey 2021			per household member	121	

Table 12 shows that thirty-six households use only one canister of water for irrigation, livestock, and other business needs. Seventeen percent of the households require two 20-litre canisters, 10% require three canisters per day and 25% of the households require 4-5 canisters per day. And only 28 per cent of the households use more than five canisters a day for their agricultural tasks. The village needs 66,320 litres of water per day for its agricultural activities to ensure agricultural production and livelihoods. The cost of agricultural water, as measured by drinking water prices, rises from €14.4 to €106.

The time spent by households obtaining the water they need and the social cost of time spent on water are shown in Table 13.

Table 13 Time and social costs

Time and social costs to get water each day in Dar Es Salam - in €					
Time	Number of households	in % on total	social costs per day*)	per month	per year
less than one hour	23	23%	9.2	276	
more than one hour	32	32%	19.2	576	
more than 2 hours	14	14%	11.2	336	
more than 3 hours	30	30%	36	1080	
All households			302	9072	108,864
average household			0.76	22.7	

\*) Social costs calculated based on the minimum wage of Niger: 60€/month, <https://www.minimum-wage.org/international/niger>

Source: Own calculation, 2025 based on survey 2021

Twenty-three households need less than an hour to get their water for the day. Thirty-two per cent of households take more than an hour to collect water for the day. Fourteen per cent of households take more than two hours and 30 per cent of households take more than three hours to collect water for the day. The time that households spend on water collection has a social cost, as it is unpaid labour. During this time, the villagers will not be able to work in the fields or in other businesses. We calculate the social costs using Niger's minimum wage of sixty €/month. Based on this assumption, the annual social cost of water in Dar es Salaam is €108,864. Dar Es Salam's water supply system adds costs and complicates daily life in the village and does not provide safe and affordable water for all households, as required by SDG 6.

## 6. RURAL SUSTAINABILITY ASSESSMENT OF DAR ES SALAM

While the household survey could not address all UN SDGs, the survey does shed light on the status of villages for five SDGs: 1 'No Poverty', 2 'End Hunger', 6 'Water', 7 'Energy' and 13 'Climate Change'. For the sustainability assessment, the qualitative results of the household survey were interpreted and translated into quantitative data to develop an overall index to measure the sustainable rural development, as shown in Figure 5.

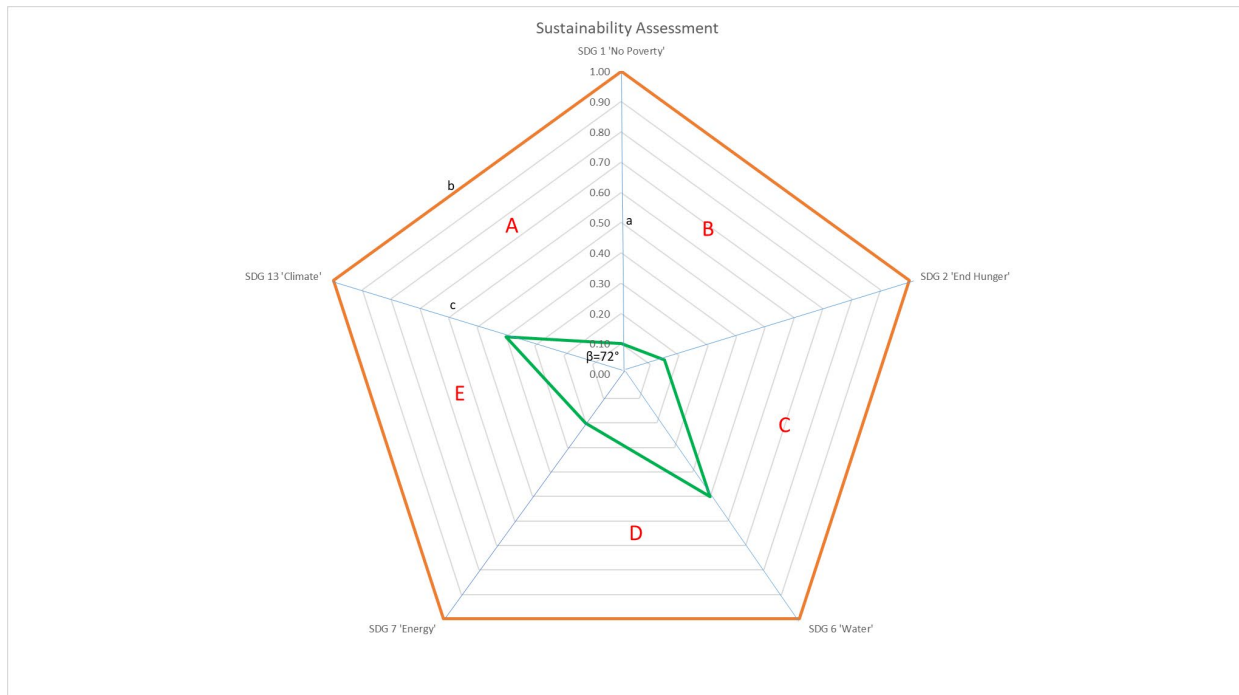


Figure 5 Rural sustainability assessment

The Sustainability Assessment Index (SAI) is defined between 0 and 1, where SAI=0 means that the sustainability goal is by no means achieved, and SAI=1 means that the local situation is sustainable according to the UN SDGs. Figure 5 shows a network diagram with five triangles (A, B, C, D, E) representing 5 SDGs. Determine the area of the measured SAI represented by the green pentagon and the optimum SAI represented by the orange pentagon.

For each triangle, we know the lines  $a$  and  $c$  as the measured SDG values and the angle  $\beta=72^\circ$ . We can therefore use the law of cosines to define the line  $b$ .

$$b^2 = a^2 + c^2 - 2 \cdot a \cdot c \cdot \cos(\beta) \quad (1)$$

$$b = \sqrt{a^2 + c^2 - 2 \cdot a \cdot c \cdot \cos(\beta)} \quad (2)$$

Once we have determined the value of  $b$ , we can use the Heron formula to find the area of the five triangles. The area of a triangle in the Euclidean plane with sides of length  $a, b, c$  can be defined by the following equations.

$$s = \frac{a + b + c}{2} \quad (3)$$

We can now use the following formula to determine the area of each triangle:

$$Area_i = \sqrt{s \cdot (s - a) \cdot (s - b) \cdot (s - c)}, \quad i = \text{triangle A, B, C, D, E} \quad (4)$$

Based on these equations, we obtain the following results:

The Green Pentagon (GP), which represents the current level of sustainability in Dar Es Salaam, has an area of  $GP = 0.1474$ . The orange pentagon (OP) – the optimal level of sustainability – has the area value  $OP = 2.8391$ . Based on this data, the Sustainability Assessment Index can be defined:

$$SAI = \frac{GP}{OP} = \frac{0.1474}{2.8391} = 0.0519 = 5.2\% \quad (5)$$

The sustainability assessment shows that Dar Es Salam has achieved only 5.2% of the targets of the five UN SDGs analysed. Therefore, we can summarise that the current situation in Dar Es Salam is far from sustainable development as expressed in the goals of the UN SDGs.

## 7. CONCLUSION

The analysis has shown that Niger is hit by four reinforcing crises: The fragmentation of the world impedes trade and the cooperation with the developed countries, the debt crises hinder investments especially in the rural areas, the enforcing dynamic of climate change causes a reduction of the agricultural production and rising food prices in Niger. The rural areas as Dar Es Salam are hit particularly hard because of their extreme poverty (SDG 1). The failure to achieve SDG 1 hampers the necessary investments in measures to mitigate the effects of climate change. The community of Dar Es Salam needs the support of the international community to address the four reinforcing threats to a sustainable rural path. But because of the current political situation (Military coup 26. July 2023 (International Institute for Strategic Studies (IISS), 2023)) this support is reduced or cancelled by western countries such as Germany (Auswärtiges Amt der Bundesrepublik Deutschland (The Federal Foreign Office), 2024), France (France 24, 2023), and USA (U.S. Mission to the African Union, 2024). And after almost 50 years, Mali, Burkina Faso and Niger left the Economic Community of West African States (ECOWAS<sup>3</sup>) (Tagesschau, 2025). The exit of the three nations will weaken the free trade, and the economic and political cooperation in West Africa. These political developments will make it more difficult to achieve the international cooperation called for in SDG 17 and will exacerbate the rural situation in Niger.

## 8. FURTHER RESEARCH

This study focuses on six of the 17 UN SDGs and therefore does not cover all aspects of sustainable rural development. The next household survey will be expanded and designed to cover all 17 SDGs. This will provide an even broader picture of community sustainability. Therefore, to fill the data gap in knowledge on rural development in West Africa, the sustainability goals and targets for rural Niger must be derived from the global UN SDGs to assess the development of local

<sup>3</sup> <https://ecowas.int/member-states/>

communities. This deeper analysis of rural areas through household surveys can provide more detailed data to develop economic policies to improve rural economic development and local welfare.

These measures must also take into account the fact that Niger's economy will also have to cope with the new US tariff system, which was published in April 2025. After leaving ECOWAS, the new tariff system has the potential to further destabilise Niger's economy and exacerbate the four existing crises.

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