NbS baseline assessment

Nature-based Solutions baseline assessment for pilot project in Elbasan municipality

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General context

Nature-based Solutions (NbS) are increasingly being recognised internationally to combat climate change. Albania has great potential and needs for NbS due to its rich ecosystems and vulnerability to climate change. In these circumstances, the International Union for Conservation of Nature (IUCN) is implementing the *Nature-based Solutions for Resilient Societies in the Western Balkans* (ADAPT) initiative to implement NbS in the Western Balkans and consequently increase ecosystem and community resilience to climate change and disaster risks in the region.

ADAPT has identified the Municipality of Elbasan in Albania to implement a pilot NbS project. This present assignment is the first step towards this pilot NbS project with the following two main objectives:

- Develop an NbS Baseline Assessment of the Shkumbini river basin, focusing on Elbasan Municipality. This assessment is multidisciplinary, covering the topics of water management, biodiversity, socio-economy and gender inclusiveness.
- Consult, identify and provide recommendations for an NbS pilot intervention in Elbasan Municipality.

Initial works in the assignment have identified a series of potential sites for implementing pilot NbS measures in the municipality. Consultations in Elbasan have later advised focusing on the Gurra catchment, located within the municipality and which contains the Shushica village; this catchment will be the scope of the rest of the assignment. The report presents the socio-economic and gender contexts of Elbasan municipaility and Shushica village, before suggestions for the NbS measures in the Gurra catchment.

Socio-economic context of Elbasan and Shushica village

Elbasan municipality contains about 10% of the Albanian population. The most important activities in Elbasan include mining, metallurgy, food processing, gravel extraction and agriculture. Mining is a large (but shrinking) sector of the economy. Quarrying of stone and gravel extraction is important since this region has the main source of material for the building industry in Albania. Agriculture employs a large part of the population, and about 34% of the land is used for agricultural purposes. Recently, the cultural, natural and tourism in Elbasan have started to attract attention as a potentially major economic activity that will help to create higher incomes and visibility in the area.

Shushica village is located 7 km from Elbasan city and hosts about 35% of the municipality population. Annual incomes in the village are provided mainly by agricultural activities and remittances from immigration. The village has a favourable climate for many vegetables and is therefore highly productive in crops, particularly fruit trees. The village is also among the national list of 100 potential touristic villages in Albania, with touristic potential for agro-tourism and with the alluvial forest near the Shkumbini river.

Gender context of Elbasan

Elbasan administration has shown a visible improvement in gender balance due to national electoral law making it compulsory to have a representation of at least 30% females. Albania is generally one of the leading countries in the Balkans for gender equality in the domain of power, with many women holding minister positions. A man heads Elbasan municipality, but half of the council comprises women.

However, women are selected to meet a certain quota only to serve the interest of party leaders and not gender-imbalanced issues, which eventually has little impact on gender equality. The situation is also unequal in rural areas of the municipality, where women are not involved in household decision-making, due to patriarchy and other issues of gender discrimination. Besides and despite usually having a higher education rate, women tend to be employed in part-time and informal sectors, in temporary and low-status

occupations, placing them at greater risk of poverty. Unemployment is also higher for women. Finally and although women play a key role in managing natural resources, they lack decision-making power in using natural resources.

Physical context of the Gurra catchment

The Gurra catchment is part of the Shkumbini river basin and contains the Shushica village. The Gurra stream is unpredictable during rainfall, bringing large amounts of sediments, continuously overflooding and jeopardising the village. Therefore, the main objective of the NbS pilot measures in the catchment will be to prevent erosion, sediment transportation and accumulation.

NbS pilot measures in the Gurra catchment

Three pilot NbS measures are proposed for the Gurra catchment. They involve planting trees along contour bunds and creating natural material check dams. Eco-tourism has not been considered at this stage but should be contemplated as a potential measure later.

NbS measure 1, contour bunds and tree planting: the first measure is for a site of 2.3 ha located in the middle of the Gurra catchment. The area is to be treated with parallel soil contour bunds along topographic contour lines, planting local tree species. The contour bunds form micro-catchments, which provide water to the trees. The latter should mix the following plants of different heights, using the stratification method:

- Juniperus: a small tree or shrub species of the cypress family with profound roots to take up water from deep in the soil and a mat of fibrous roots closer to the soil's surface to capture rainwater. It bears fruits, known as "juniper berries". The berries are too bitter to be eaten raw and are usually sold dried and used to flavour meats, sauces, and stuffings.
- Ruscus: a flowering plant, growing to approximately 1 metre tall. Its root has medicinal uses against haemorrhoids, gallstones, atherosclerosis and for blood circulation issues (e.g., pain, heaviness, leg cramps, leg swelling, varicose veins, itching, and swelling). In some cultures, the roots are eaten the same way as asparagus.

The Net Present Valeur (NPV) of this measure, calculated for a period of 10 years, is positive at +182,141 EUR; the measure is therefore very profitable. A women's group should be instituted at the start of the pilot project to implement and manage the project.

NbS measure 2, barriers and vegetation planting: the second measure targets two areas of 2.7 ha in total. Both areas are heavily eroded, with visible gullies and steeper slopes. It is suggested to treat the gullies with permeable check-dams made of stones, deposing fertile sediments and organic matter in the gullies, and slowing the water flow during heavy rainfall events. Gullies can hereafter be planted with suited vegetation to benefit from the deposited sediments. Approximately 60 barriers in total are foreseen to treat the gullies. It is advised to mix the following three tree varieties in both areas:

- Lithocarpus, commonly known as the stone oaks. These trees have an important ecological role as they provide habitats and nourishment to wildlife, and their fruits feed insects and vertebrates. This specie is exceedingly strong, heavy and durable.
- Fraxinus, commonly called ash, is a flowering plant in the olive and lilac family, with strong root systems spreading widely. The specie has many medicinal benefits, including anticancer, anti-inflammatory, neuroprotective, antioxidant, anticytotoxic, antiaging, antimicrobial, and antihypertensive. The tree is also used to dye black wool.
- Rosa canina, commonly known as the dog rose, is a climbing wild rose species, ranging in height from 1 to 5 metres. The dog rose is used to make syrup, tea and marmalade. The flowers can also be eaten in salads, candied or preserved in vinegar, honey and brandy. It has been grown or encouraged in the wild

to produce vitamin C from its fruit, especially during scarcity or wartime conditions. Finally, the wild plant is widely used for stabilising soil in land reclamation and specialised landscaping schemes.

Fraxinus and Rosa canina can create economic benefits thanks to their medicinal properties, while Lithocarpus prevent erosion and help restore soils. The NPV, calculated for a period of 10 years, is positive, at +143,607 EUR; therefore, the measure is also very profitable. Similarly to measure 1, a women's group should be instituted at the start of the pilot, to implement and manage the project.

NbS measure 3, check-dams: the third measure aims to build stone permeable check-dams within the northwards upstream part of the part of Gurra catchment. The objective is not to store water but to slow the flow gradually during heavy rainfall events and deposit sediments. A total of nine structures is proposed, distributed along the upstream part of the catchment to temporise regularly the flow. The total cost is approximately 116,000 EUR. Although the measure has benefits, such as limiting the volume of sediments transported downstream to the village, the monetary benefit is difficult to assess. Furthermore, this measure is not gender-specific.

Monitoring and Evaluation framework

A series of 14 indicators are suggested to monitor the implementation of the three NbS measures in the Gurra catchment. These indicators are organised in the following six themes:

- civil engineering, for all related to structures to be built;
- erosion control;
- socio-economic benefits;
- gender and governance benefits;
- biodiversity benefits;
- and CO2 sequestration.

I. Introduction

I.1. Context

Meteorological risks are the main natural hazards in Albania. The latest report of the Intergovernmental Panel on Climate Change (IPCC), the sixth Assessment Report (AR6[1]), predicts for the Balkans increasing temperature, especially in the frequency of hot days (Figure 1), associated with, in the Mediterranean region, a decrease in average precipitation. This combination will create increased aridity, ultimately leading to a higher risk of forest fires. At the same time, it is expected that the Mediterranean region will see increased daily rainfall (Figure 2), which, combined with increased aridity and negative anthropogenic impacts, such as encroachment due to rapid urbanisation, will lead to higher occurrence and vulnerability to floods.

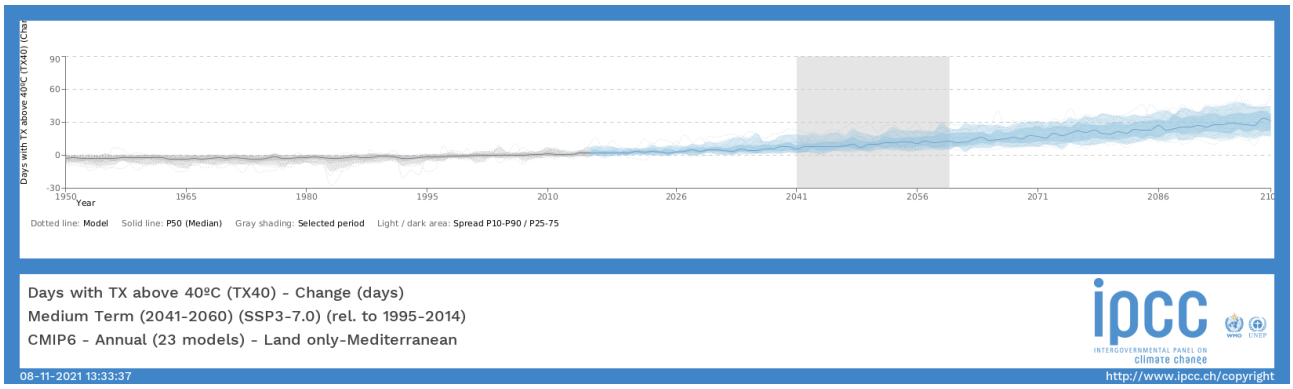


Figure 1: Change, in the Mediterranean region, of number of days with maximum daily temperature above 40°C under climate change, having as a reference the period 1995 to 2014 and for the SSP3 7.0 scenario (Source: IPCC WGI Interactive Atlas[2])

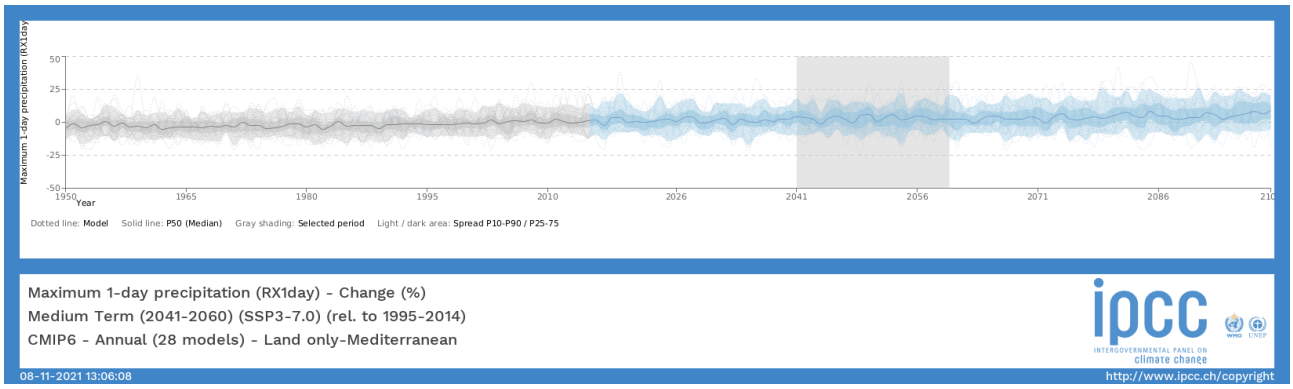


Figure 2: Change (%) in the Mediterranean region of maximum daily precipitation under climate change, having as a reference the period 1995 to 2014 and for the SSP3 7.0 scenario (Source: IPCC WGI Interactive Atlas)

In this context, there is an urgent need in Albania to mitigate and adapt to climate change. Nature-based Solutions (NbS) are increasingly being recognised internationally to combat climate change and the IUCN is spearheading this effort (Figure 3). Albania has great potential and needs for NbS due to its rich ecosystems and vulnerability to climate change. In these circumstances, IUCN is implementing the ADAPT initiative to

[1] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

[2] https://interactive-atlas.ipcc.ch/

implement NbS in the Western Balkans and consequently increase ecosystem and community resilience to climate change and disaster risks in the region.

Figure 3: IUCN's Conceptual framework on Nature-based Solutions, as an umbrella term for ecosystem-related approaches.

In Albania, ADAPT has identified the Municipality of Elbasan to implement a pilot NbS project. The municipality is located within the Shkumbini river basin. It is particularly vulnerable to flood risk and soil erosion, due to upstream degraded forests and greater occurrence of extreme rainfall, due to increased pollution being carried by floodwaters. The Shkumbini river basin hosts diverse natural habitats and contains upstream the Shebenik-Jabllanice National Park, middlestream the Kuturman Nature Park and downstream the Divjake–Karavasta National Park. This work in the Municipality of Elbasan is the object of the assignment.

I.2. Objective the assignment

The assignment has the following two main objectives:

- Develop an NbS Baseline Assessment of the Shkumbini river basin, focusing on Elbasan Municipality. This assessment is multidisciplinary, covering the topics of water management, biodiversity, socio-economy and gender inclusiveness.
- Consult, identify and provide recommendations for an NbS pilot intervention in Elbasan Municipality.

I.3. Objective and structure of the NbS Baseline Assessment report

Initial works in the context of this assignment have identified a series of potential sites in the Elbasan municipality for implementing pilot NbS measures. The process was as follows:

1. During the inception workshop, three areas of interest were suggested to implement pilot NbS measures: stream Mandazeza, stream Llixha and stream Gurra e Poshtme (Shushica village).
2. A list of potential NbS measures was suggested for the three sites.
3. This list was discussed during the validation workshop, and eventually, the stream Gurra and its catchment (Shushica village) was selected (Map 1), with measures related to erosion control.

Map 1: Location of the Gurra stream (in blue), with its catchment area (in yellow).

The present report, named NbS Baseline Assessment, follows the scoping report, which scoped the issues at the scale of the Shkumbini river basin and more precisely the Elbasan municipality. The NbS Baseline Assessment report focuses further on Gurra catchment and is multidisciplinary by covering the topics of water management, biodiversity, socio-economy and gender inclusiveness. It considers two spatial scales of analysis: Elbasan municipality and Gurra catchment, where the NbS pilot sites are located. The report also identifies and provides recommendations for the NbS pilot interventions. It is organised as follows:

- Chapter 2 summarises the socio-economic analysis.
- Chapter 3 contains the main aspects of the gender analysis.
- Chapter 4 introduces some basic physical characteristics of Gurra catchment.
- Lastly, Chapter 5 contains the description of potential NbS measures in the territory of the village.

II. General socio-economic context

The socio-economic context is presented generally for Elbasan municipality and more specifically for Shushica village, in which the NbS pilot sites are located.

II.1. Elbasan municipality

II.1.a. Demography

The total population in the municipality was 276,765 in 2018. Different sources yielded different values for the population, hence the figure from the Ministry of Finance and Economy has been used.

II.1.b. Socio-economy

The Regional Statistical Yearbook, prepared by INSTAT in 2019 and 2020 provides the following information:

- In 2018, 9.7% of the total population of Albania lived in the Elbasan Region (statistical region NUTS 3). Its population declined by 1,272 inhabitants (the second lowest value in the country) due to net internal migration. The median age of the population was 37.1 years.
- The number of employees in Elbasan region represents 11.4% of Albania's total, while the unemployment rate is 6.6%. The highest employment rate of 61.5% in Albania was registered in Elbasan Region. Higher employment rates were reported for males than for females, as is the case generally in Albania. Elbasan Region has recorded the highest employment rate in the agriculture sector (67.2%) and the lowest employment rate in the services sector (23.4%).
- In 2018, the average monthly salary was 43,115 ALL (approx. 348 EUR), while the average monthly expenditure for consumption was 63,847 ALL per household (approx. 515 EUR). Elbasan Region reached 6.8% of Albania's GDP in 2017, contributing 0.05% in real terms for that year, while the GDP per capita, equal to 377,000 ALL (approx. 3,040 EUR), was lower than the national average. The number of active enterprises in 2018 was 13,419, covering the economic activities as shown in the Table 1.

Table 1: Actives entreprises in Elbasan municipality (Source: Regional Statistical Yearbook, INSTAT)

Number of Active Enterprises											
Year	Production of goods	Agriculture, Forest & Fishing	Industry	Construction	Services	Trade	Transportation & Storage	Accomodation & Food Services	Information & Communication	Other	
2017	5,583	4,438	950	195	7,618	3,496	582	1,881	121	1,538	
2018	6,247	5,149	891	207	7,172	3,310	524	1,702	116	1,520	

- The owners of these enterprises were predominantly male (71%), a minority (29%) owned by females.
- Albanians almost exclusively owned the businesses (98%) in Elbasan, with few exceptions of internationals (2%).
- The nature of the economic activities is presented in Table 2.

Table 2: Nature of economic activities in Elbasan municipality (Source: Regional Statistical Yearbook, INSTAT)

Weight of GDP in Economic Activity (%)								
Total weight as% compared to GDP of Albania	Mining-Quarrying	Manufacturing	Electric/gas, water supply, waste management	Construction	Trade	Accomodation /restaurants	Transport/Communication	Other services
5.20	2.70	17.60	11.10	4.00	3.30	5.00	1.70	1.80

- The GDP growth rate in Elbasan was 0.7% in 2017, as opposed to 3.8% in Albania.

Overall, human activity and settlements are concentrated around the flat areas surrounding the Shkumbini River and its tributaries. The most important activities in the area include gravel extraction, processing plants and agriculture. Having a high population density concentrated along the river and with most of the human activities also taking place close by the river, the different sources of pollution generally cause a higher impact

since the pollutants have less opportunity to diffuse before they reach the water body. Therefore, the concentrations of pollutants increases[3].

Mining, metallurgy, food processing, and construction materials are among the leading industries. Construction, especially in housing, is the main factor for investment growth. Mining is a large (but shrinking) sector of the economy, several mines being now inactive. In addition to mines, there is also quarrying of stone and collection of gravel from the Shkumbini River, particularly in the vicinity of Librazhd. Gravel extraction is important since this region has the main source of material for the building industry in Albania[4].

The main agricultural products in the basin are tobacco, olives, wheat, maise, potatoes, vegetables, fruits, sugar beets, grapes, meat, honey, dairy products, and traditional medicine and aromatic plants. Much of this production is exported to Italy and Greece. Agriculture in the basin employs a consistent part of the population and about 34% of the land is used for agricultural purposes. However, it is limited primarily to small family operations and subsistence farming because of the lack of modern equipment, unclear property rights, and the prevalence of small, inefficient plots of land[5].

Semi-intensive fish farming activities occur along the Shkumbini's tributaries such as Bushtrica, Gostima, Luniku, Zaranika, and in the about 50 artificial reservoirs built for irrigation purposes. These farming activities usually occur in small ponds or streams inside private properties, which are often not licensed[6].

Lastly, several touristic facilities are present in the Shkumbini river basin, especially in the delta area. Several restaurants (including bars and cafes) operate in the basin, though restoration remains a developing sector. Many restaurants offer traditional and international cuisine. The prices are relatively low and the food offer makes a strong point for Albanian tourism[7].

II.1.c. Economic and financial situation of the Elbasan municipality

The municipality is considered to be a multi-functional centre along the Corridor VIII and the Road Egnatia. It is an important economic and infrastructure regional node for agriculture, livestock and spatial and industrial eco-tourism development. The territorial strategy of Elbasan states that the service sector has the highest added gross value, followed by agriculture and the industry. Meanwhile, the industrial sector has the highest productivity while agriculture has the highest potential. Improved investment in the irrigation and drainage systems, together with reduced waste discharges along the river, will further develop the agricultural sector and contribute to overall economic development for Elbasan Municipality. The city of Elbasan provides the main stimulus for economic development in the municipality territory. Recently, the cultural, natural and tourism in Elbasan have started to attract attention as a potentially major economic activity that will help to create higher incomes and visibility in the area. Given the situation, infrastructure and administrative investments are forecasted to develop the eco-tourism sector further.

The financial situation in Elbasan, as well as for neighbouring municipalities, is shown in Table 3. It can be seen that Elbasan municipality has the highest income in the region, but also the highest expenditure and debt.

[3] Ministry of Tourism and Environment, 'Shkumbini River Basin Management & Climate Change Adaptation Plan' (Tirana, Albania: Ministry of Tourism and Environment, 2017).
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.

Table 3: Financial situation of Elbasan and neighbouring municipalities (Source: Elbasan functional waste area feasibility study)

Income, Expenditure, Investments and Accumulated Debt in the Municipalities of the Elbasan Region								
Municipality	Income 2019		Expediture 2019		Investments 2019		Accumulated Debt 2020	
	M ALL	M EUR	M ALL	M EUR	M ALL	M EUR	M ALL	M EUR
Elbasan	1,902.00	15.34	1,853.00	14.94	344.00	2.77	153.90	1.24
Belsh	226.00	1.82	230.00	1.85	66.00	0.53	128.20	1.03
Rrogozhine	311.00	2.51	309.00	2.49	45.00	0.36	113.20	0.91
Cerrik	323.00	2.60	350.00	2.82	89.00	0.72	111.80	0.90
Librazhd	532.00	4.29	582.00	4.69	188.00	1.52	55.80	0.48
Peqin	266.00	2.15	278.00	2.24	39.00	0.31	32.30	0.26
Gramsh	423.00	3.41	468.00	3.77	145.00	1.17	19.70	0.16
Prenjas	312.00	2.52	268.00	2.16	48.00	0.39	16.20	0.13
Total	4,295.00	34.64	4,338.00	34.96	964.00	7.77	631.10	5.11

II.2. Shushica village

II.2.a. Socio-economic context

There are 1,100 households in the village of Shushica, with a total population of 4,000 inhabitants, 51% males and 49% females. Almost 50% of the inhabitants live along the Gurra Stream. Shushica is a territory comprised of nine smaller villages. Shushica centre is only 7 km from Elbasan city and hosts about 35% of the population.

There are records of ancient civilisation in the territory of Shushica from the second century A.D. The Egnatia Road was built by the Romans, which linked Rome with Thessaloniki.

Annual incomes in the village are provided mainly by agricultural activities and remittances from immigration.

The village is among the government's list of 100 potential touristic villages in Albania. The village has touristic potential for agro-tourism and with the alluvial forest near Shkumbini river.

II.2.b. Agricultural production

The village of Shushica has a favourable climate for many vegetables and is therefore highly productive in crops. There are about 400 hectares of agricultural land. Fruit trees are:

- cherries and peaches, harvested in May;
- grapes and figs, harvested from July until October;
- pomegranates, citrus fruit, walnuts and olives, harvested in November and December.

Production of peaches lasts from May until October.

The village also breeds livestocks, with cattle, sheeps, goats, and to a lesser extent pigs and poultry. Fodder crops, like lucerne and maise, are also grown in the village's territory.

II.3. Methodology used for the cost-benefit analysis of the NbS pilot cases

The Net Present Value (NPV) was computed for each of the NbS measures suggested for Gurra catchment (see Chapter 5). Assumptions for the costs and benefits of the planted vegetation were based on information provided by Elbasan municipality. In addition, local producers and markets have been contacted to provide production yields and market prices for leaves/fruit/bark of the trees.

Costs and revenues have been adjusted using forecasted inflation prices in the next 10 years. The discount rate used is the 10-year Treasury Bond rate of the Albanian government, i.e., 6.25%.

Benefits have been forecasted for the next 10 years based on the following assumptions:

Assumptions on Inflation forecast		
Year		
1	2023	7%
2	2024	4%
3	2025	3%
4	2026	3%
5	2027	3%
6	2028	3%
7	2029	3%
8	2030	3%
9	2031	3%
10	2032	3%

The discount rate used is the 10-year-old rate of Albanian Government Bond.

III. General gender and governance context

This chapter summarises key gender issues and concerns. The analysis also aims to provide recommendations for gender responsive NbS interventions, to ensure the participation of women during the implementation process.

The sections below cover the following aspects:

- A brief description of the methodology and analytical framework.
- An overview of the gender equality context in Albania.
- And the specific case of Elbasan.

III.1. Methodology and Analytical framework

The gender analysis was attentive to include men and youths, in addition to women, from various socio-economic and cultural groups in Elbasan. This provided accurate insights into the roles, rights and practices that affect women in this area. Various data were needed for the analysis:

- Demographic statistics (e.g., demographics, ethnicity, income).
- Education system (e.g., no. of schools, universities, access to education).
- Employment statistics (government and private sectors).
- Land owning according to sex.
- Political participation.

The methodology was organised around:

- analysis of legal and policy framework,
- gender statistics and identification of gender gaps,
- analysis of background gender patterns and,
- identification of opportunities for advancing gender equality through the pilot NbS measures.

The analytical framework implied the observation at several levels:

- **structural**, for prevailing norms and patterns, through desk survey;
- **institutional**, for policies, practices and resources, through desk research and interviews with representatives of local institutions and organisations in Elbasan;

- **community and individual levels,** for gender roles and inequalities at individual and community levels, through interviews with local actors in Elbasan.

In addition, the IUCN has developed the Gender Analysis Guide[8], which advises examining gender through the specific angles of environmental stressors and vulnerabilities. The guide also offers guiding questions and potential data sources, which were used in the analysis.

III.2. Gender and governance in Albania

As a legacy of Albania's communist past, the equity of rights is formalised and sanctioned in the Albanian constitution. The electoral law makes it compulsory to have at least 30% of female candidates in the national parliament. Consequently, the Government administration in the last years has shown a visible improvement in gender balance. This wave has also been transmitted to all the public administration governance, giving full power and leadership to women and girls. Albania is therefore one of the leading countries in the Balkans for gender equality in the domain of power, with many women holding minister positions. The government also highlights education and equality in the labour market as key factors for the emancipation of women.

Although women's representation in municipal councils has improved, the battle for the integration of women in politics continues. The current quota of 30% representation in politics is not enough. Moreover, the situation is rather unequal in rural areas outside Tirana, as in Elbasan municipality. Inequities are noticeable in the labour market. Women are usually employed in part-time and informal sectors, in temporary and low-status occupations, placing them at greater risk of poverty. In addition, usually women are not involved in decision-making within rural households, due to patriarchy and other issues of gender discrimination. They have fewer interactions outside the domestic sphere than men and, as a result, are less informed and prepared than men in the same community. For example, women are usually prevented from participating in emergency planning and action. In addition, biological factors, such as pregnancy and lactation, restrict women's mobility and therefore create a greater need for intervention during a disaster.

Concerning natural resources, women tend to be more interested in conserving nature. They are primary users of natural resources and play a key role in managing these resources. However, while they legally have the same rights as men regarding land tenure or resource management, they lack decision-making power in using natural resources. They are highly impacted by environmental degradation and natural disasters but are instrumental in restoring the natural environment under their care after floods.

III.3. Governance and gender context in Elbasan

III.3.a. Governance

Elbasan is one of the leading municipalities in terms of culture, and has a long history of respectful balance between women and men, that have created a safe path for women in governance and politics. The Judicial power in this municipality is an example of gender balance, since 50% of the judges are women; the head of the court is a woman. The representation of Elbasan county in the Albanian Parliament is composed of four men and two women. A man heads Elbasan Municipality, but half of the council is composed of women and there is high participation of women at all the levels of decision making.

However, a study conducted in 2015 by the United Nations Development Program (UNDP) in Albania shows that the ratio of women councillors does not positively affect perceived power in decision-making. According to the report, women councillors face numerous structural obstacles in their decision-making power. These

[8] IUCN (2021). Gender Analysis Guide: A technical tool to inform gender-responsive environmental programming for IUCN members, partners and peers. First edition. Gland, Switzerland: IUCN.

barriers are related to the weak competencies of local councils, the weak fiscal capacity of local government units, the process through which party leaders select women as councillors, and the constraints that party leaders impose on local decision-makers.

The same study shows that most women councillors are responsible for representing the interests of women and girls in the municipal council. However, while councillors raise their voices to emphasise issues faced by women and girls in the community, this has little impact. Women are selected to meet a certain quota, but this serves the interest of party leaders and not gender-imbalanced issues. Women tend to propose various draft decisions related to leisure activities for women, parks, kindergartens, employment opportunities, economic assistance, business support, support for women in rural areas, and social housing. Meanwhile, draft decisions proposed by men focus mainly on employment opportunities, economic assistance and social housing.

III.3.b. Socio-economic background

The gender ratio in Elbasan is approximately balanced, with slightly more women than men (49% of men and 51% of women). The number of births and deaths in Elbasan (Table 4) shows an increase in youth. However, the lack of employment opportunities, infrastructure, social and other public services, such as education or health services, has led to emigration and a population reduction.

Table 4: Births and Deaths in Elbasan municipality (Source: INSTAT).

	2017		2018		2019	
Municipality	**Births**	**Deaths**	**Births**	**Deaths**	**Births**	**Deaths**
Elbasan	1,456	1,107	1,470	1,137	1,368	1,034

Statistics from the “Aleksander Xhuvani” University in Elbasan indicate that more women attend university. However, prevailing patriarchal issues were noticed during field trips and workshops. This was presented as a social norm in the workshop, leaving no space for women to lead households. Similarly, and despite a higher education rate, women have a higher unemployment and inactivity rate in Elbasan (Table 5).

Table 5: Work-related statistics for Elbasan municipality (Source: INSTAT).

Employment rate						
	2016	2017	2018	2019	2020	2021
Total	57,7	61,2	61,5	60,7	59,7	62,2
Men	61,2	64,5	65,4	65,0	61,9	65,6
Women	54,2	57,8	57,7	56,4	57,5	58,9
Inactivity rate						
	2016	2017	2018	2019	2020	2021
Total	33,5	32,2	34,2	35,9	36,3	33,2
Men	29,3	28,6	31,3	31,0	33,2	30,0
Women	37,7	36,0	36,9	40,6	39,2	36,2
Unemployment rate						
	2016	2017	2018	2019	2020	2021
Total	13,2	9,7	6,6	5,4	6,4	6,9
Men	13,4	9,6	4,8	5,8	7,3	6,3
Women	13,0	9,8	8,5	4,9	5,5	7,6

Using the framework of IUCN's Gender Analysis Guide[9], it was attempted to assess a few gender-based criteria (Table 6). However, due to data unavailability, the criteria were assessed based on descriptive and qualitative data obtained during the workshops and interviews. There are no formal or informal women associations and no initiatives for women's empowerment in Elbasan. Women are engaged in agriculture, but there is little information on land ownership.

Table 6: Assessment of gender-specific criteria in Elbasan (Based on IUCN's Gender Analysis Guide)

Criterion	Assessment in Elbasan
Participation of women in predominant economic activities related to the use of natural resources	Given the fact that the women work informally, their financial benefit is not formalised
Representation of women among landowners	There are few landowners women in Elbasan (source the locals)

IV. Physical context of Gurra catchment

The Gurra catchment is part of the Shkumbini river basin. Its main village is Shushica, which lies in the cadastral region number 3445. It is separated in two by the Gurra stream. The stream is unpredictable during rainfall, brings a large amount of sediments, continuously overfloods and jeopardises many residential homes. About 150 hectares of very productive agricultural land lies next to the stream downstream and get regularly flooded. Stones and coarse sediments are present in the river bed, illustrating the torrential flow intensity during heavy rain events. The stream presents, therefore, intensive erosion hazards by eroding the catchment area and, in particular, the most upstream houses of the village and the village cemetery land. Nine concrete check dams are located in the village area, the biggest is about 65m long across the stream and about 4 m high. Most of the check dams are filled with sediments.

Preventing erosion, sediment transportation, and accumulation will be the main objective of the NbS pilot activities in Gurra catchment. Erosion in upstream areas results from degraded areas with a lack of vegetation. Vegetation plays a vital role in mitigating erosion and landslide during heavy rain. Building several check-dams further upstream in the catchment reduces in addition the flow energy and captures transported sediments. Consequently, the pilot NbS measures proposed for the Gurra catchment involve planting trees along contour bunds and creating natural material check dams. These are presented in the following chapter.

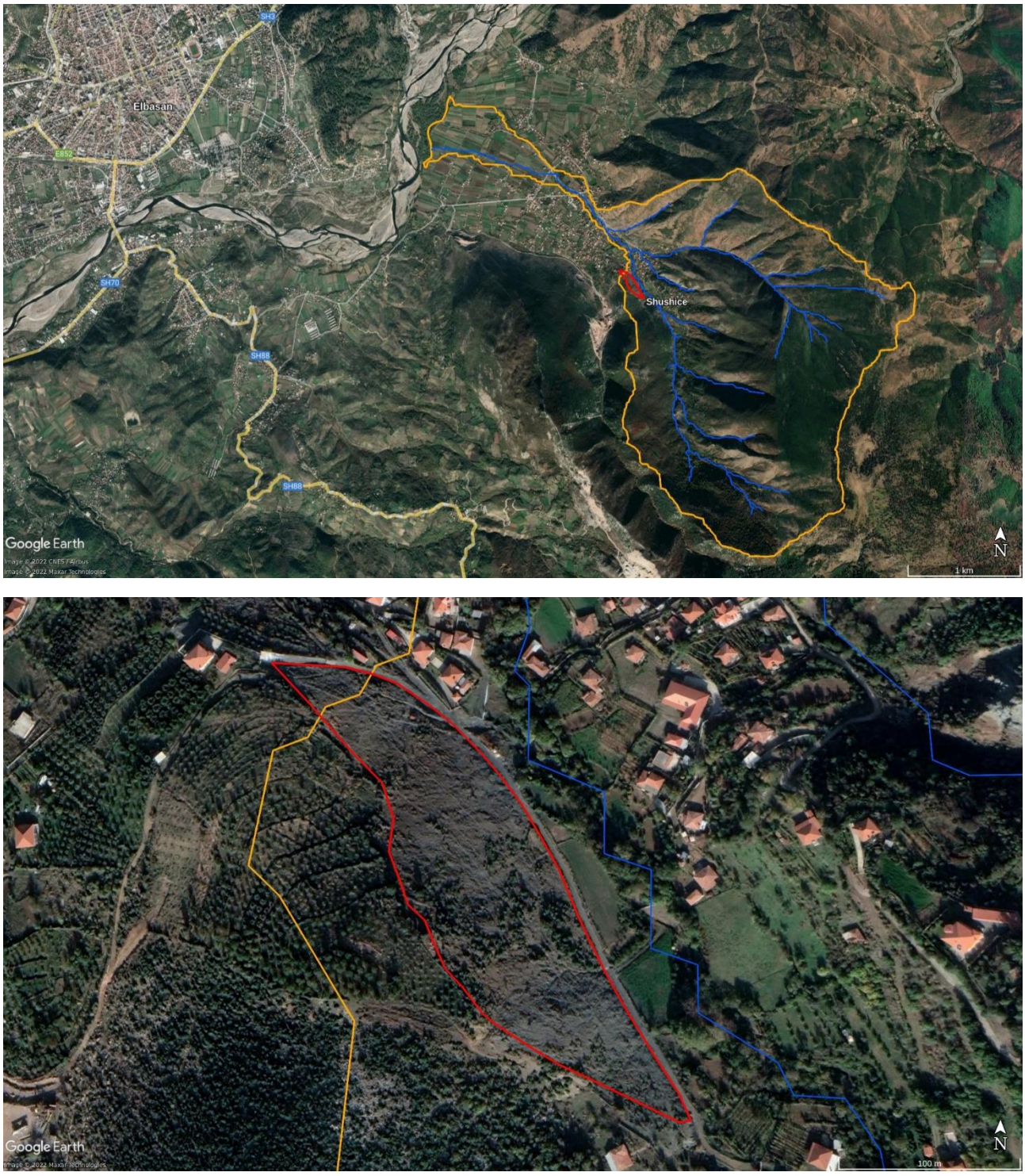
V. NbS measures in Elbasan

Three NbS measures are proposed within the Gurra catchment. Although Elbasan region and Shushica village are flagged with high eco-touristic potential, the earlier consultations in this assignment have not identified eco-touristic NbS measures. Hence ADAPT should examine the potential of eco-touristic NbS measures at a later stage, around Shushica village or, more generally, in Elbasan municipality.

[9] IUCN (2021). Gender Analysis Guide: A technical tool to inform gender-responsive environmental programming for IUCN members, partners and peers. First edition. Gland, Switzerland: IUCN.

V.1. Measure 1: contour bunds and tree planting

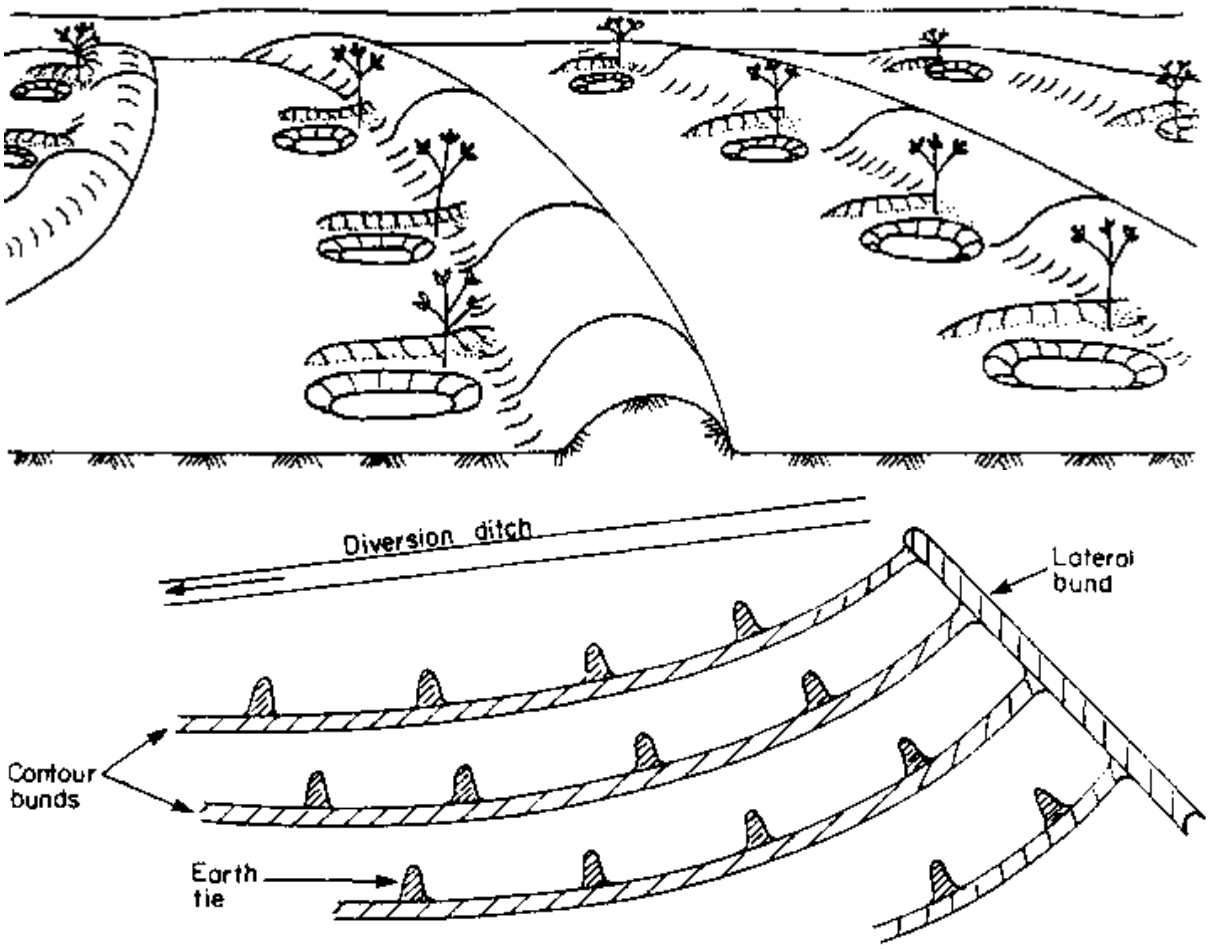
The first measure is for a site located in the middle-stream / southern portion of the Gurra catchment (Map 2).



Map 2: Location of the NbS Measure 1 in Gurra catchment, top: overview, bottom: zoom (in blue Gurra stream; in yellow Gurra catchment; in red the area for Measure 1).

V.1.a. Technical rationale

The area for this measure is approximately 2.3 ha and is degraded compared to the surrounding environment. It is suggested to treat the area with soil contour bunds and planting local trees. Bunds should be built following the topographic contour lines, at close spacing. Small earth ties divide the system upslope into individual microcatchments for providing water to trees. Infiltration pits are excavated in the junction between ties and bunds, based on the water flow along the bund. The tree is planted next to the pit[10] (Figure 4).



[10] W. Critchley et al., *Water Harvesting. A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production* (Rome (Italy): FAO of the UN, 1991), http://www.fao.org/docrep/U3160E/U3160E00.htm.

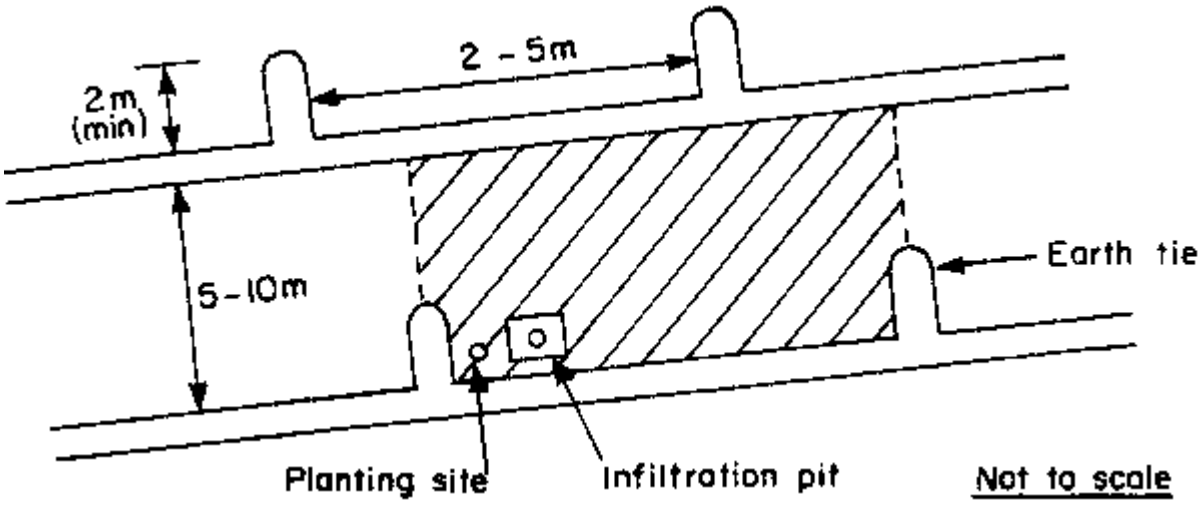
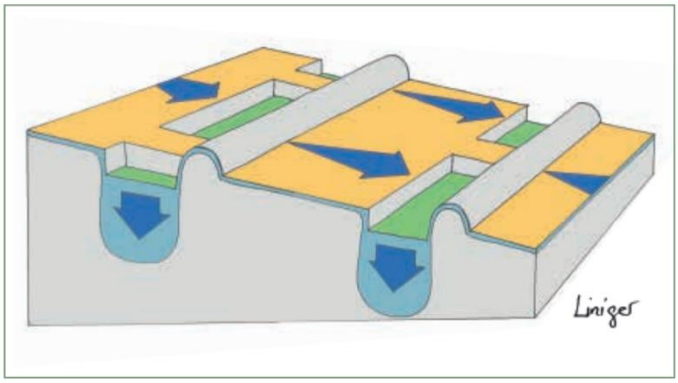


Figure 4: Illustration of the contour bunds and trees planting (Source: Critchley et al. 1991[11])

The overall layout consists of a series of almost parallel earth bunds, at a spacing of between 5 and 10 metres depending on the slope: 10m for slope up to 0.5% and 5m on steeper slopes. The size of the microcatchment is typically 25m2, which fixes the distance between the earth ties (hence 2.5 m for 10m spaced contour bunds or 5m for 5m spaced contour bunds). A diversion ditch protects the system at the border where necessary[12].

Bund heights vary, but are in the order of 20 - 40 cm depending on the prevailing slope, with higher bunds on steep slopes. The base width must be at least 75 cm[13]. The bunds are formed by machine by excavating a channel and creating a bund downslope (Figure 5). Bunds are gradually built up by annual maintenance and adding soil to the bund. Such bunding systems can be applied on all types of relatively permeable soils (e.g. alluvial, red, laterite, brown and, shallow and medium black soils) but not on clays or vertisols[14]. Fodder grasses or alike can be planted on the bunds to help stabilise (Figure 6). Stones can also be used for the same effect.



Fanya chini and pits for banana planting, Muranga, Kenya. (HP. Liniger)

Figure 5: Scheme of the contour bunds measure- alternative design without upslope earth ties (Source: Studer and Liniger, 2018[15]).

[11] Ibid.
[12] Ibid.
[13] Ibid.
[14] Rima Mekdaschi Studer and Hanspeter Liniger, *Water Harvesting: Guidelines to Good Practice*, 2018.
[15] Ibid.

Figure 6: Stabilisation of bunds with grass (Source: Studer and Liniger, 2018[16]).

Due to the steep flow in this case in Gurra catchment, a 5m spacing of bunds is deemed required, associated with 5m spacing between the earth ties and the bund height should be of 40 cm. With respect to the pilot, a total of approximately 15 contour bunds are envisioned. The amount of earthwork is approximately as in Table 7.

Table 7: Assessment of the earthwork (Based on: Critchley et al. 1991[17]).

Size unit microcatachement			Volume earthwork per unit (m3)	Nr unit per ha	Earthwork m3/ha	Total earthwork for the site (m3)
Bund spacing	Tie spacing	Area (m2)				
5	5	25	2.0	400	800	1,840

Concerning the planting, it should mix species in different layers, using the stratification method with a succession of plants of different heights. It is suggested to associate the following two plants for Measure 1:

- Juniperus communis, the common juniper, is a small tree or shrub species in the cypress family Cupressaceae. Juniperus communis varies in form, ranging from 10 metres tall to a low, often prostrate spreading shrub in exposed locations. It has needle-like leaves in whorls of three; the leaves are green, with a single white stomatal band on the inner surface. It is dioecious, with male and female cones, which are wind pollinated, on separate plants. The fruit, known as "juniper berries", are berry-like cones, initially green, ripening in 18 months to purple-black with a blue waxy coating. They are spherical, 4–12 millimetres in diameter, and usually have three (occasionally six) fleshy fused scales, each scale with a single seed. The berries are too bitter to be eaten raw and are usually sold dried and used to flavour meats, sauces, and stuffings. The seeds are dispersed when birds eat the cones, digesting the fleshy scales and passing the hard, unwinged seeds in their droppings. The male cones are yellow, 2–3 mm long, and fall soon after shedding their pollen in March–April. Junipers are well adapted to dry soil conditions. They usually have profound roots to take up water from deep in the soil and a mat of fibrous roots closer to the soil's surface to capture rainwater. Juniper leaves were found to harbour fungi with potent anti-fungal compounds; the plant is approved in the United States to treat fungal infections.

[16] Ibid.

[17] Critchley et al., *Water Harvesting. A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production*.

- Ruscus, is a genus of six species of flowering plants. The species are evergreen shrub-like perennial plants, growing to approximately 1 metre tall. They have branched stems with numerous cladodes (flattened, leaf-like stem tissue) 2 to 18 centimetres long and 1 to 8 centimetres broad. The true leaves are minute, scale-like, and non-photosynthetic. The fruit is a red berry 5 to 10 millimetres in diameter. Ruscus is spread by seed and by means of underground rhizomes. It can colonise extensive patches of ground. The root has medicinal uses against haemorrhoids, gallstones, atherosclerosis and for blood circulation issues (e.g., pain, heaviness, leg cramps, leg swelling, varicose veins, itching, and swelling). In some cultures, the roots are eaten the same way as asparagus.

Both plants can create economic benefits thanks to their medicinal properties.

To cover the 2.3 ha of measure 1, it is suggested to plant:

- Two years old Juniperus communis, with soil bread, planted with a density of 350 roots/ha, making approximately 700 seedlings.
- One year-old Ruscus with breadfruit, approximately 2,600 seedlings planted with seeds.

The planting should be successive, as follows:

- First Juniperus communis,
- later on Ruscus, to form the lower floor of vegetation.

V.1.b. Cost-benefit analysis

The assumptions taken for Juniperus communis are as follows:

- It is used for cosmetics, alcoholic drinks and flavouring drinks, like “Raki”. Its leaves are also used as fuel for heating ovens.
- Market value varies from 300 ALL to 350 ALL per kg of fruit, 80 ALL to 100 ALL per kg of leaves.
- Fruit production in the fifth year is 2,000 kg per ha. From the fifth to tenth year, production grows at 10% per annum.
- Leaves production in the fifth year is 1,000 kg per hectares. From the fifth to tenth year, production grows at 10% per annum.

The assumptions taken for Ruscus are as follows:

- Roots production from third year is 3,000 kg/year and grow by 7% evey year until the tenth year.
- Market price per kg of roots is 250 ALL/kg.

Note: if these plants or trees are certified by EU-BIO, market prices are increased at a range from 25-40%.

The NPV has been calculated for a period of 10 years. It is positive, at +182,141 EUR, and therefore the project is very profitable. The costs considered are for:

- civil engineering (earthworks), 6,972 EUR;
- planting, 15,456 EUR;
- and maintenance over 10 years, 17,431 EUR;

For calculating future cash inflows (revenues), forecasted inflation rates have been considered (as presented in sub-section II.3 (p13). The discount rate used is the 10-year-old rate of the Albanian Government Bond.

This is summarised below (computations over 10 years):

NBS 1		
* all figures in EUR @ EUR=117 ALL		
Initial investment Planting (2.3 hectares with Juniper, Rusculus)	**€**	**15,456.00**
Sum of discounted cash flows (income)	€	221,999.92
NPV of planting investment for NBS 1	€	206,543.92
Costs for maintenance	**€**	**17,431.27**
Cost of Civil Engineering (removal of earthwork)	**€**	**6,972.05**
NPV for NBS 1	€	182,140.59

V.1.c. Gender inclusiveness

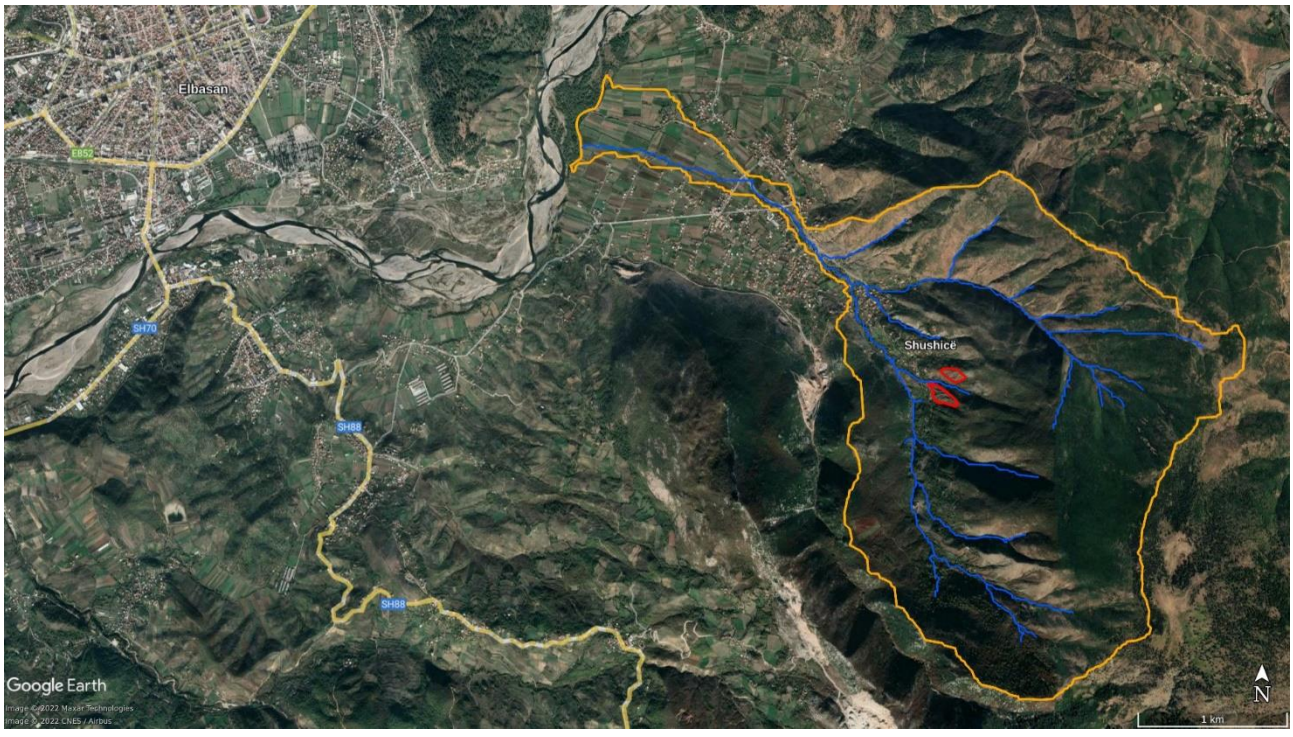
A women's group should be instituted at the start of the pilot project. This group should:

- oversee the earthworks,
- plant the seedlings,
- take regular care of the trees,
- harvest the production from Juniperus and Ruscus,
- process the harvesting,
- sell and cash in the revenues.

This is to secure a regular income stream for women of the villages.

V.2. Measure 2: barriers and vegetation planting

The second measure targets two areas, close to the first measure (Map 3). Both areas are heavily eroded, with visible gullies and steeper slope. Area 1 extends to 1.1 ha and Area 2 to 1.6 ha.

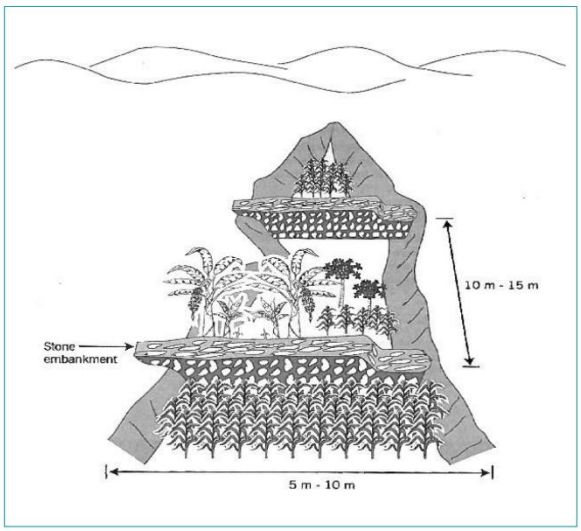


Map 3: Location of the NbS Measure 2 in Gurra catchment, top: overview, bottom: zoom (in blue Gurra stream; in yellow Gurra catchment; in red the area for Measure 2).

V.2.a. Technical rationale

Since the terrain is much more degraded, it is not suited to the previous measure of contour bunds for trees. Instead, it is suggested to treat the gullies by blocking them with permeable stones or wood barriers, deposing fertile sediments and organic matter, and slowing the water flow during heavy rainfall events (Figure 7). The barriers (in stone or wood) are spaced regularly along the slope, between 10 to 15m, to slow down the flow gradually and allow the building of soils. Gullies can be planted with suited vegetation, such as trees, annual crops or fodder grasses. Apart from the benefits of increased productivity, the threat of further expansion of gullies and loss of land is mitigated[18].

[18] Mekdaschi Studer and Liniger, *Water Harvesting*.



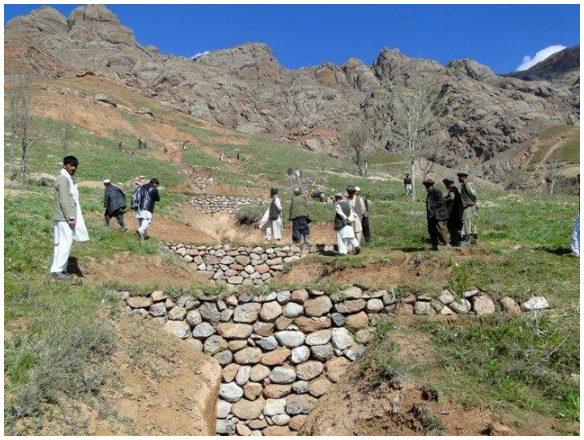


Figure 7: Gully treatment with stone barriers. Left: scheme from Studer and Liniger[19]. Right: photo from Afghanistan (Source: WOCAT).

Wood barriers can be built of planks, heavy boards, slabs, poles or old railroad ties (Figure 8). The main objectives of wood barriers are to hold fine and coarse material carried by flowing water in the gully, to stabilise gully heads by slowing down the flow[20].

Figure 8: Example of gullies treatment with wood barriers.

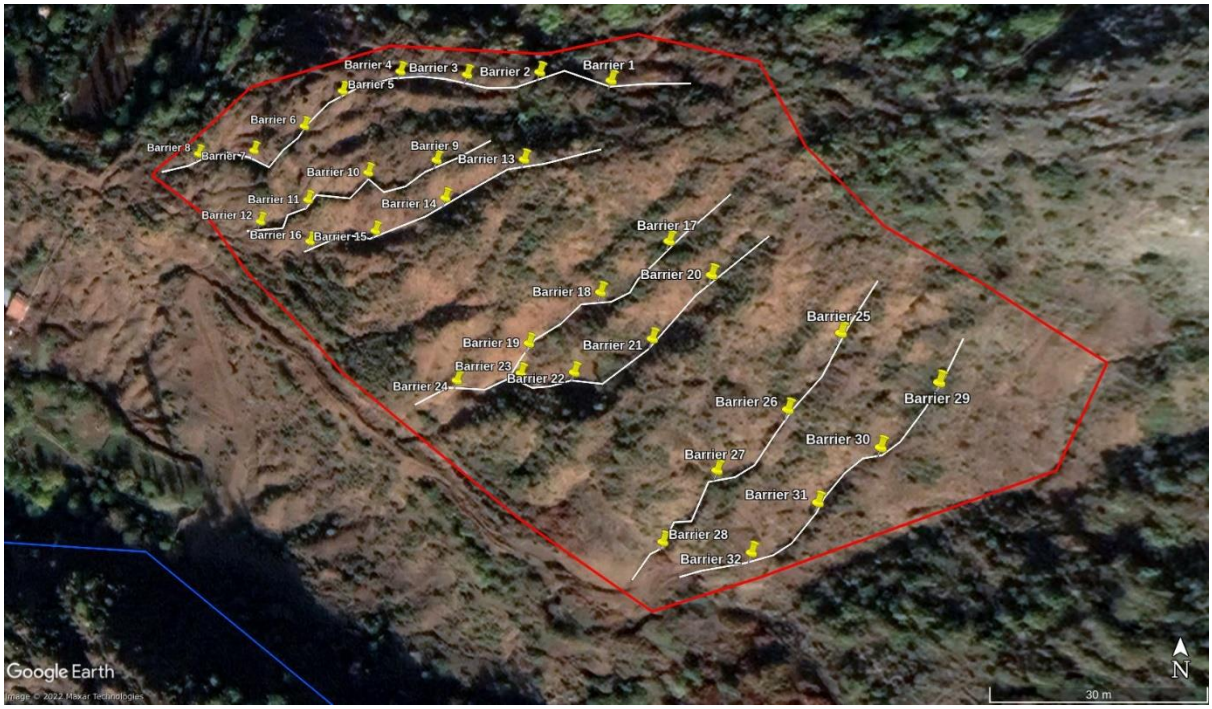
Stone barriers can be built in case stones or rocks of appreciable size and suitable quality are available in Elbasan. Flat stones are the best choice for dam making as they can be laid in such a way that the entire structure is keyed together. If round or irregular shed stones are used, the structure should be encased in woven wire to prevent outside stones from being washed away. If the rocks are small, they should be enclosed in a cage of woven wire[21]. This stone barrier seems the most appropriate in the area of Elbasan as stones can be sourced locally.

[19] Ibid.
[20] FAO, *Watershed Management Field Manual. Gully Control* (Rome (Italy): FAO of the UN, 1986).
[21] Ibid.

In this case in Gurra catchment, approximately 60 barriers in total are foreseen to treat the gullies, as detailed below.

Area 1:

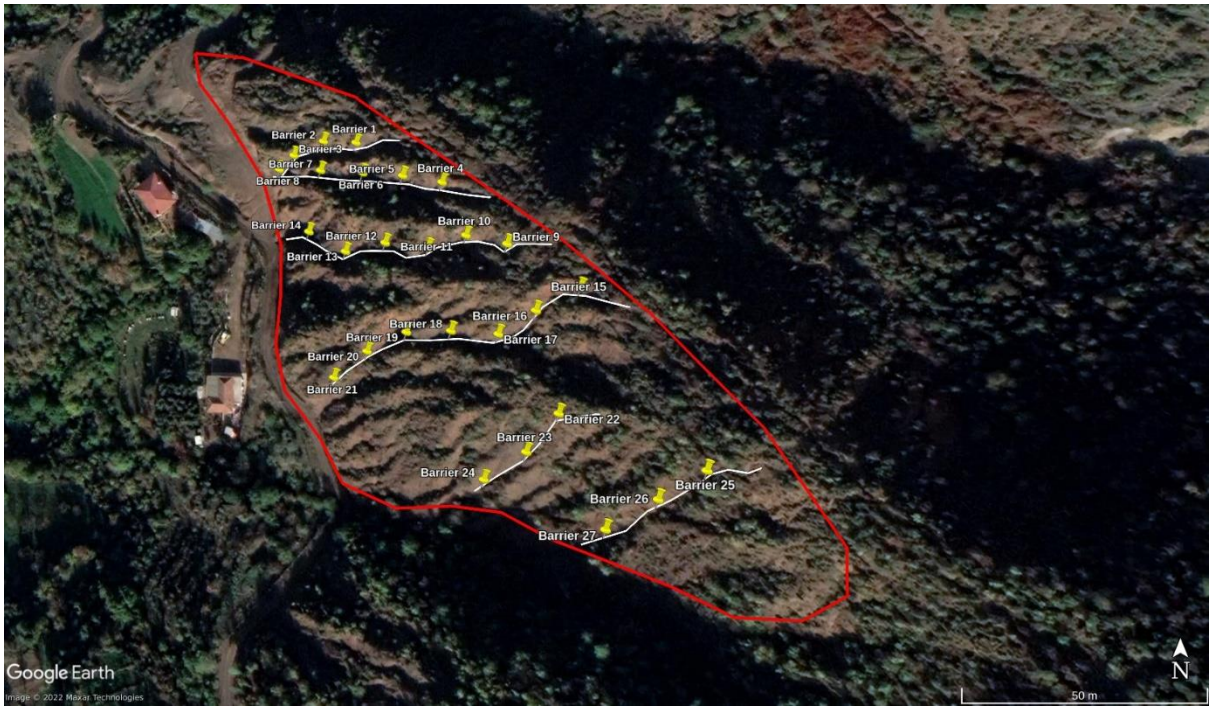
As a first approximate design, seven ravines are visible in area 1 (Map 4). The barriers, most likely in stone, have to be spaced regularly along the slope, between 10 to 15m, to slow down the flow gradually and allow the building of soils. If a distance of 15 m is chosen between the structures, approximately 32 barriers are envisioned for zone 1.



Map 4: Approximate design for area 1, with identified ravines in white and suggested location for the barriers as pinpoint.

Area 2:

Six ravines are noted in area 2 (Map 5). Taking the same distance of 15m between barriers, it leads to approximately 27 barriers.



Map 5: Approximate design for area 2, with identified ravines in white and suggested location for the barriers as pinpoint.

Tree planting for Area 1 and 2:

It is advised to mix the following three tree varieties in both Area 1 and 2:

- Lithocarpus, commonly known as the stone oaks. These trees have an important ecological role, their fruits being a food source for insects and vertebrates. This specie is exceedingly strong, heavy and durable. It has an attractive light colour with a prominent grain. Thanks to its dense constitution and long-living nature, it is resistant to fungal attack. Lithocarpus generally provide habitats and nourishment to wildlife and help to maintain a good quality of air by soaking up air pollutants. Lithocarpus tree canopies prevent soil erosion and provide nutrients to the surrounding soil.
- Fraxinus, commonly called ash, is a flowering plant in the olive and lilac family. There are about 45 to 65 species of usually medium to large trees, mostly deciduous, though some subtropical species are evergreen. The seeds, popularly known as "keys" or "helicopter seeds", are a type of fruit known as a samara. Ash trees are known for having strong root systems that spread widely. It is strongly recommended that ash trees be planted a minimum of 18 meters apart to allow enough distance for each tree's root system to thrive. The specie has a wide spectrum of medicinal benefits, including anticancer, anti-inflammatory, neuroprotective, antioxidant, anticytotoxic, antiaging, antimicrobial, and antihypertensive. Moreover, the tree is also used to dye wool black.
- Rosa canina, commonly known as the dog rose, is a climbing wild rose species. The dog rose is a deciduous shrub normally ranging in height from 1 to 5 metres, though sometimes it can scramble higher into the crowns of taller trees. Its stems are covered with small, sharp, hooked prickles, which aid it in climbing. Leaves have a pleasant fragrance when bruised. The dog rose blooms from June to July, with sweet-scented flowers, between a deep pink and white. The flesh (shells) of rose hips contain high levels of antioxidants, mainly polyphenols and vitamin C / ascorbic acid, as well as carotenoids and vitamins B and E. It also contains natural sugars, organic acids, polyunsaturated fatty acids, phenolics, and essential oil, making them excellent for consumption. The dog rose is used to make syrup, tea, and marmalade. The flowers can also be eaten in salads, candied or preserved in vinegar, honey and brandy. It has been grown or encouraged in the wild to produce vitamin C from

its fruit, especially during scarcity or wartime conditions. Finally, the wild plant is used for stabilising soil in land reclamation and specialised landscaping schemes.

Fraxinus and Rosa canina can create economic benefits thanks to their medicinal properties, while Lithocarpus prevent erosion and help restore soils.

To cover the total of 2.7 ha (Area 1 and 2), it is suggested to plant:

- Lithocarpus (oak), 2 years old, with soil bread, 420 seedlings planted with seeds.
- Fraxinus, 2 years old, with soil bread, 340 seedlings planted with seeds.
- Rosa canina, with 1 pot of soil, 3000 seedlings planted with seeds.

The planting should be successive, as follows:

- First Lithocarpus (oak) and Fraxinus,
- later on Rosa canina, to form the lower floor of vegetation.

V.2.b. Cost-benefit analysis

The assumptions taken for Lithocarpus are as follows:

- Leaves production in the fifth year is 3,000 kg per hectare. From the fifth to tenth year, production grows at 10% per annum.
- Fruit production begins in the seventh year, at 3,000 kg per ha and grows by 20% after the seventh year.
- Bark production begins in the fifth year with 400 kg per ha. From the fifth year until tenth, production grows at 5% per annum.
- Market price is 150 ALL per kg of leaves.
- Market price is 160 ALL per kg of fruits.
- Market price is 200 ALL per bark.

The assumptions taken for Fraxinus are as follows:

- Leaves production in the fifth year is 1,000 kg per hectare. From the fifth to tenth year, production grows at 10% per annum.
- Bark production begins in the fifth year with 500 kg per ha. From the fifth year until tenth, production grows at 10% per annum.
- Market price is 120 to 160 ALL per kg of leaves.
- Market price is 200 ALL per bark.

The assumptions taken for Rosa canina are as follows:

- Fruit production begins in the third year, at 500 kg per ha, then 1,500 kg per ha from fifth year, reaching 4,000 kg per ha in tenth year.
- Market price is 350 ALL per kg of fruits.

Note: if these plants or trees are certified by EU-BIO, market prices are increased at a range from 25-40%.

The NPV has been calculated similarly to measure 1. It is positive, at +143,607 EUR, also very profitable. The costs considered are for:

- civil engineering (59 check-dams), 105,240 EUR;
- planting, 25,704 EUR;
- and maintenance over 10 years, 20,463 EUR;

Values are summarised below (computations over 10 years):

NBS 2		
* all figures in EUR @ EUR=117 ALL		
Initial investment Planting (2.7 hectares with Lithocorpus, Fraxius, Rosa Canina)	**€**	**25,704.00**
Sum of discounted cash flows (income)	€	295,014.17
NPV of planting investment for NBS 1	€	269,310.17
Costs for maintenance	**€**	**20,462.80**
Cost of Civil Engineering (construction of 59 gullies)	**€**	**105,239.93**
NPV for NBS 2	€	143,607.44

V.2.c. Gender inclusiveness

Similarly to Measure 1, a women's group should be instituted at the start of the pilot project. This group should:

- oversee the construction of the check-dams,
- plant the seedlings,
- take regular care of the trees,
- harvest the production from Lithocarpus, Fraxinus and Rosa,
- process the harvesting,
- sell and cash in the revenues.

This is to secure a regular income stream for women of the villages.

V.3. Measure 3: check-dams

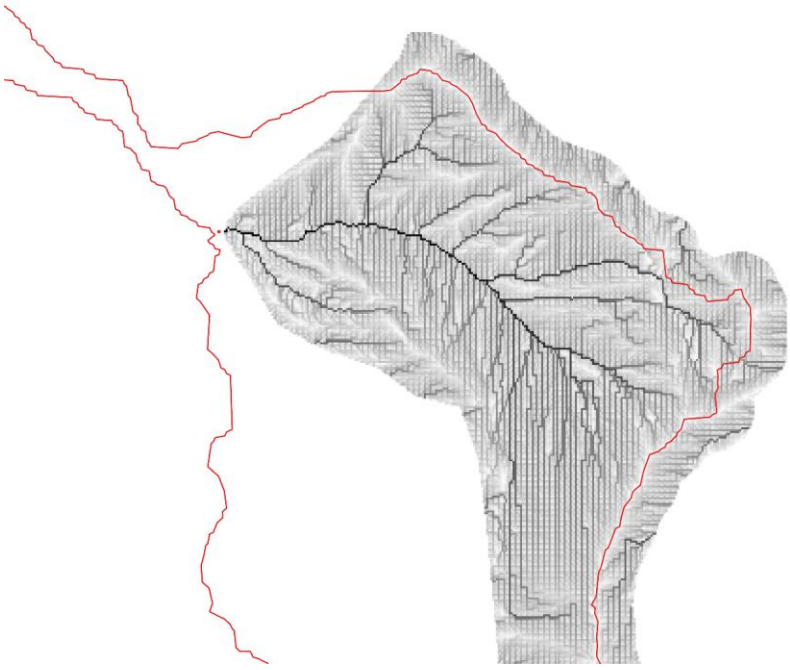
Based on discussions during field visits, the suggestion for the third measure is to build check-dams within the northwards upstream part of the part of Gurra catchment (Map 6).

Map 6: NbS Measure 3 focusing on the upstream northern stream of Gurra, indicated with the orange arrow (in blue Gurra stream and in yellow Gurra catchment).

V.3.a. Technical rationale

The measure is similar to the second measure, with permeable check-dams made of stones. The objective is not to store water but to gradually slow the flow during heavy rainfall events and deposit sediments.

To assess the number of structures, the Digital Elevation Model (DEM) of the area is processed to compute the area draining along the stream (Map 7). The rationale is to distribute the structures to temporise regularly based on the flow accumulation, by definition the accumulated area flowing into each point in the basin



Map 7: In red, boundaries of Gurra catchment; in greyed colour: zones of flow accumulation (the darker, the more flow accumulation).

To identify the location of the structures, a simplified and coloured version of this flow accumulation map is used, to distribute the structures based on the area being drained in the stream:

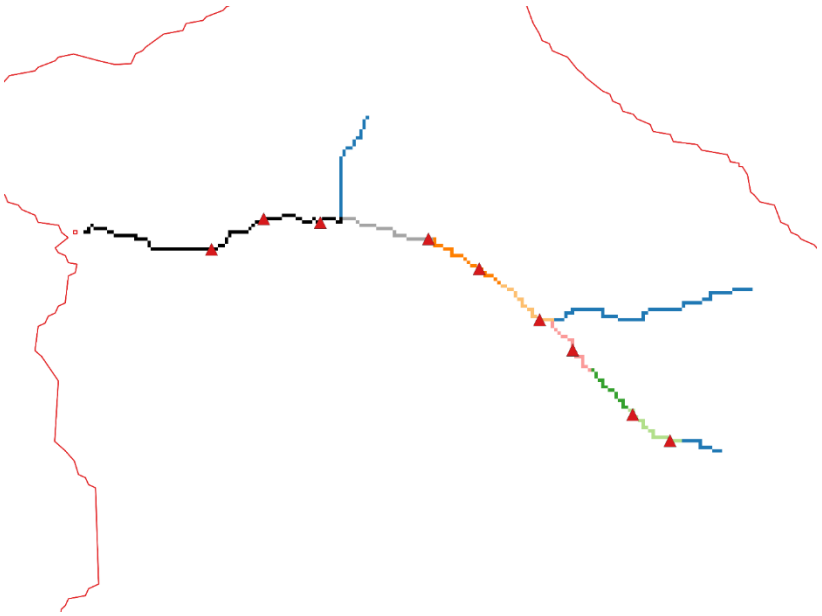
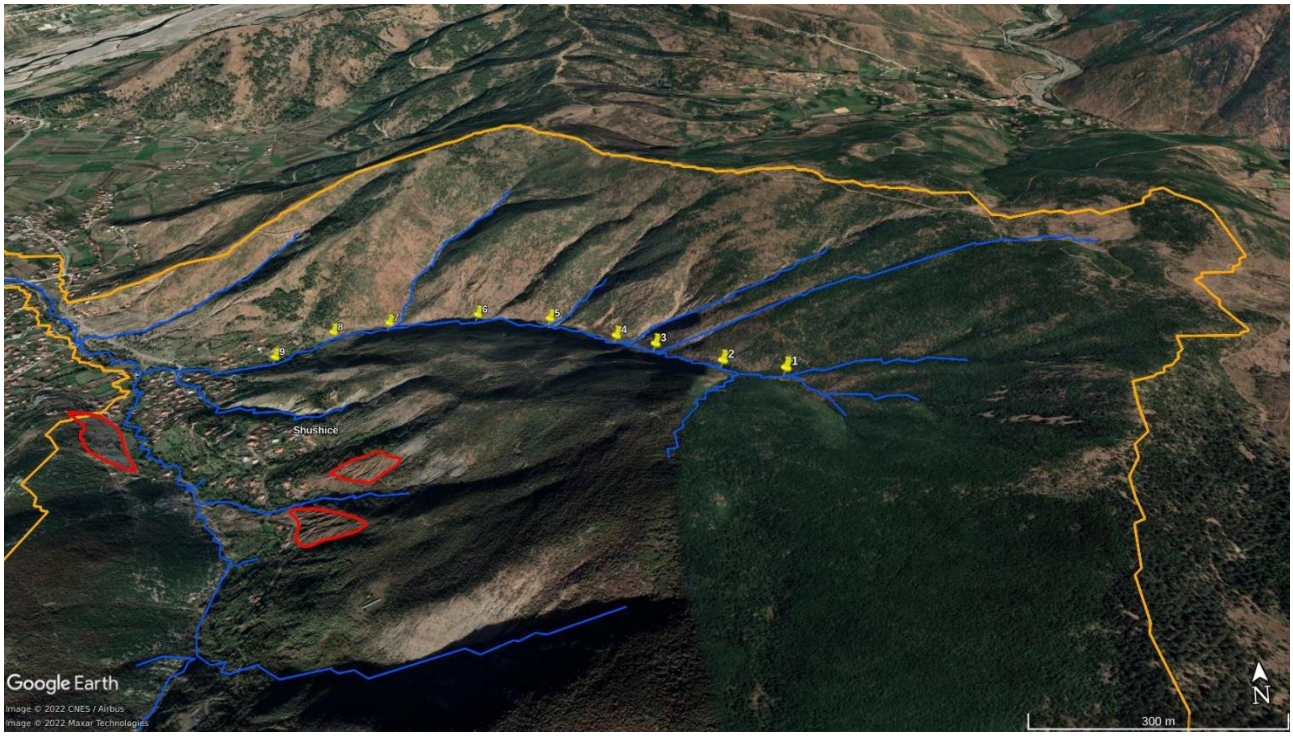


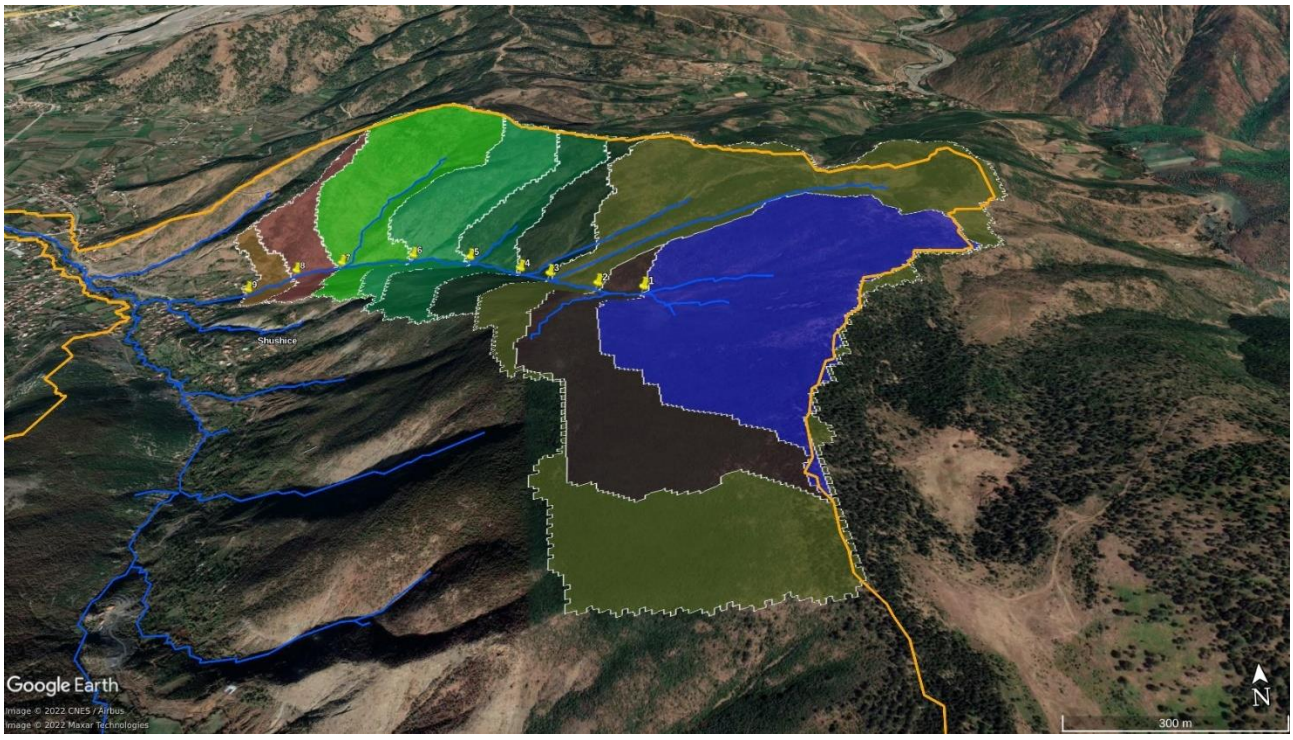
Figure 9: In red, boundaries of Gurra catchment; in different colours: graduation of flow accumulation; in red triangle: the location suggested for the check dams.

A total of nine structures is proposed. Their locations are then adjusted on Google Earth, to account for the terrain and for any confluence of small streams:



Map 8: Upstream part of Gurra catchment (orange boundaries), with the streams in blue, the zones of Measures 1 and 2 in red and as pinpoints the location suggested for the nine check-dams.

The catchment areas of the nine check-dams are shown in Map 9 and are summarised in Table 8. To assess the capacity of the check-dams to abate the volume of sediments carried in by the stream, results from the Revised Universal Soil Loss Equation (RUSLE) applied in countries neighbouring Albania are used, namely values for European countries surrounding Albania (European Soil Data Centre[22]) and for Bosnia and Herzegovnina (Tosic et al., 2013[23]). From these references, the typical rate of 20 t/ha/an is assumed for the area, resulting in the potential erosion rate mentioned in Table 8.



Map 9: Catchment areas of the nine check-dams (pinpoints).

Table 8: Catchment area and erosion potential upstream of the proposed check dams (assuming a potential erosion rate of 20 t/ha/an in the catchment areas).

Check dam	Catchment area (ha)	RUSLE (Erosion potential)	
		(t/an)	Incremental (t/an)
1	89	1,777	1,777
2	123	2,453	676
3	219	4,374	1,922
4	240	4,809	435
5	266	5,325	515
6	295	5,909	584
7	337	6,740	831
8	350	7,010	270
9	356	7,128	118

The last column of the table indicates the amount of sediment potentially created between each check dam and is, therefore, a proxy to assess the amount of sediment captured by each structure. The third and first

[22] https://esdac.jrc.ec.europa.eu/content/soil-erosion-water-rusle2015

[23] Radislav Tosic et al., 'Assessment of Soil Erosion Potential Using Rusle and Gis: A Case Study of Bosnia and Herzegovina', *Fresenius Environmental Bulletin* 22 (1 November 2013): 3415–23.

check-dam are the structures that potentially have the greatest impact on reducing the sediments carried by the streams.

V.3.b. Cost-benefit analysis

Only the costs for civil engineering have been calculated. This measure has benefits, such as limiting the volume of sediments transported downstream to the village. This benefit is however difficult to assess in a monetary value, hence has not been estimated at this moment.

The total cost for the nine check dams is as follows:

NBS 3		
* all figures in EUR @ EUR=117 ALL		
Cost of Civil Engineering (construction of 9 check dams)	**€**	**115,764.00**

V.3.c. Gender inclusiveness

This measure is not gender-specific.

V.4. Monitoring and Evaluation framework

A series of 14 indicators are suggested to monitor the implementation of the three measures in Gurra catchment (Table 9). These indicators are organised in the following six themes:

- civil engineering, for all related to structures to be built;
- erosion control;
- socio-economic benefits;
- gender and governance benefits;
- biodiversity benefits;
- and CO2 sequestration.

The indicators were identified in three steps:

1. From ADAPT's Monitoring and Evaluation framework: ADAPT has commissioned an assignment to develop a Monitoring and Evaluation framework for the pilot projects. This is logically the first source to identify the indicators and their values (baseline and milestones). Indicator 6.1 (see Table 9) is taken from this framework, while indicator 3.1 is a modified version of its indicator "Other revenues". Reasons for discarding other indicators proposed in the framework are explained below.
2. From IUCN's NbS standards[24]: the gender-related indicators 4.1 and 4.2 are inspired by these standards.
3. From this assignment, to derive indicators specific to the three NbS measures in Gurra catchment, for all remaining indicators.

The following indicators from ADAPT's Monitoring and Evaluation framework are not considered for the three measures in Gurra catchment:

- "Disaster Damage": this information is not available for Shushica village for the baseline period.

[24] IUCN, International Union for Conservation of Nature, *IUCN Global Standard for Nature-Based Solutions: A User-Friendly Framework for the Verification, Design and Scaling up of NbS: First Edition*, 1st ed. (IUCN, International Union for Conservation of Nature, 2020), https://doi.org/10.2305/IUCN.CH.2020.08.en.

- “Erosion (Land Degradation)”: it cannot be used for Measure 1 & 2 since the scale is too small for available GIS information (needed to compute the USLE equation) and Measure 3 does not treat the upstream area (but capture the sediments in the stream), hence would have no impact on this indicator. However, Table 9 (2.1 and 2.2) proposes specific indicators related to erosion control.
- “Tourism revenue”: no eco-touristic NbS measures have been proposed through the consultations in this assignment, hence this indicator is not considered at this stage. However, the region has been flagged for its eco-touristic potential; hence this indicator might become relevant at a later stage.
- “Timber revenue”: the plants proposed for Measures 1 and 2 are not exclusively trees and are not meant for timber.
- “Agricultural revenues”: the three NbS measures do not produce agricultural benefits.
- “Personal income of the local population”: the economic benefits are assessed directly from the measures (medicinal products, indicator 3.1).

Table 9: Indicators to monitor the implementation and operation of the three NbS measures in Gurra catchment.

Nr	Indicator	Baseline value	Milestone values	Source / comments
1. Civil engineering				
1.1	Measure 1: number of contour bunds in working conditions	0	• 2024: 15 • 2025: 15 • 2030: 15	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
1.2	Measure 2: number of stone barriers in working conditions	0	• 2024: 59 • 2025: 59 • 2030: 59	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
1.3	Mesure 3: number of check-dams in working conditions	0	• 2024: 4 • 2025: 9 • 2030: 9	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
2. Erosion control				
2.1	Measure 3: sediments are removed every year upstream of the nine check-dams	No	• 2024: Yes • 2025: Yes • 2030: Yes	Specific indicator identified in this assessment.
2.2	Mesure 3: volume of sediments being removed from the check dams (in tons)	0	*To be defined during detailed design*	• Specific indicator identified in this assessment. • Milestone values to be defined after detailed design. A first assessment of sedimentation potential is provided in section V.3.a above.
3. Socio-economic benefits				
3.1	Measure 1 and 2: revenue from medicinal and aromatic plants harvesting (in ALL)	0	*To be defined during detailed design*	• Modified indicator from ADAPT's Monitoring and Evaluation framework. • Milestone values to be defined after detailed design.
4. Gender and governance benefits				
4.1	Inhabitants directly and indirectly affected by the measures are involved in all processes of the three measures	No	• 2024: No • 2025: Yes • 2030: Yes	• Modified indicator IUCN's NbS standards. • Milestone values to be defined after detailed design.
4.2	Decision-making processes in managing the three measures respond to the rights and interests of all participating and affected stakeholders	No	• 2024: No • 2025: Yes • 2030: Yes	• Modified indicator IUCN's NbS standards. • Milestone values to be defined after detailed design.
5. Biodiversity benefits				

Nr	Indicator	Baseline value	Milestone values	Source / comments
5.1	Measure 1: percentage of Juniperus communis in healthy conditions	0%	• 2024: 20% • 2025: 40% • 2030: 100%	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
5.2	Measure 1: percentage of Ruscus in healthy conditions	0%	• 2024: 0% • 2025: 40% • 2030: 100%	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
5.3	Measure 2: percentage of Lithocarpus in healthy conditions	0%	• 2024: 20% • 2025: 40% • 2030: 100%	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
5.4	Measure 2: percentage of Fraxinus in healthy conditions	0%	• 2024: 20% • 2025: 40% • 2030: 100%	• Specific indicator identified in this assessment. • Milestone values to updated after detailed design.
5.5	Measure 2: percentage of Rosa canina in healthy conditions	0%	• 2024: 0% • 2025: 40% • 2030: 100%	• Specific indicator identified in this assessment. • Milestone values to be updated after detailed design.
6. CO2 sequestration				
6.1	Measure 1 and 2: volume of CO2 sequestrated (in kg/ha/an)	0	*To be defined during detailed design*	• Indicator from ADAPT's Monitoring and Evaluation framework. • This indicator is deemed to be irrelevant due to the small implementation scale of Measure1 and 2 (in total 5.0 ha). • Milestone values to be defined after detailed design.