

SEVERAL ASPECTS REGARDING THE SPECIFIC ACTIVITIES FROM MUREȘ DEFILE

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Abstract: The geographical location, as well as the natural conditions (the relief's morphometry, less than favourable climatic conditions, as well as the presence of shallow soils) played a deciding role in developing some activities characteristic to mountain areas, mainly represented by forestry and animal husbandry, with peaks and lows caused by social and historical factors that also affected the population of the area. Agriculture became one of the most important components of the defile's economy, and still remains the main source of nourishment and income for a rather significant part of the population. When it comes to industry, it developed based on the extraction and exploitation of the area's natural riches (construction rocks, mineral waters, timber), which are then incorporated into the economic circuit. The tertiary activities, in a strong correlation with the territory's specificity, are less representative, trade being the one activity that stands out (timber, mineral water, construction rocks).

Key words: hydroelectric complex, mineral water, rock quarries, subsistence agriculture

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INTRODUCTION

The study at hand intends to capture some of Mureș Defile's social-economic activities and their specificities, an analysis that follows a certain logic, grouped on sets of components (primary, secondary, and tertiary), based on the interpretation of statistical data and on careful field research.

The first category (*the primary sector*) includes *agriculture* with all its aspects (land fund structure and land usage, plant culture and vegetal production, animal husbandry and animal production, as well as sheepherding) and *forestry*, where issues like the manner of organising and managing the forestry fund from the defile are being addressed, followed by industrial activities (*the secondary sector*), where the development of this category of activities fits in the context imposed by the natural potential, of underground resources (andesite and mineral waters).

The hydroelectric potential is also included here, followed by timber and logging operations. All this led to the emergence and development of several industrial branches: the extraction industry, electric energy industry, logging industry and mineral water bottling. The last

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set of components aims to present the activities comprised by the *tertiary sector*, more precisely the characteristics of the communications and transport network, trade, education and healthcare.

AGRICULTURAL LAND AND ACTIVITIES

In 2011, the agricultural domain of Mures Defile was 15 138 ha, representing 21.6% of the total land fund (70 087 ha), forests and other vegetated surfaces comprising 76.2% (53 388 ha), while other surfaces had 2.2% (1 561 ha), encompassing waters and lakes, communication routes and constructions, each with only 0.3% (202 ha, 217 ha, 236 ha) and barren lands (1.3%, 906 ha) (fig. 1). At an administrative level, the percentage of agricultural land, in 2011, was lower than in 1990, in two cases: in Răstolița (from 22.0% in 1990, 5 826 ha, to 21.2% in 2011, 5 652 ha) and in Lunca Bradului (from 19.7% in 1992, 6 113 ha, to 19.0% in 2011, 5 913 ha), while, in Stânceni, the agricultural surface increased from 28.5%, 3 555 ha in 1990 to 28.6%, 3 573 ha in 2011).

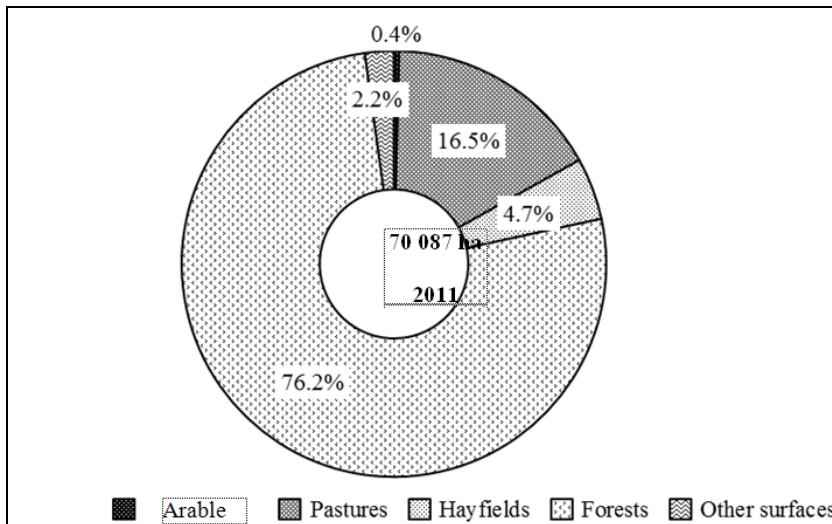


Figure 1. Land fund structure according to usage, 2011

If one analyses the structure of *agricultural surfaces*, the *pastures* register 16.5% (11 559 ha), followed by *hayfields* (4.7%, 3 311 ha) and *arable land* (0.4%, 268 ha), a modest figure, due to restrictive natural conditions.

Arable lands and crops

The pedoclimatic and relief characteristics found in intermountain depressions and in the surrounding mountains play a crucial role in the development of the agricultural profile of these settlements. The profile is mainly represented by animal husbandry, due to large tracts of land occupied by pastures and hayfields (21.2%, 14 860 ha), which increased over time at the expense of forests, and during the last decades at the expense of arable land, like in the case of Stânceni Commune (146 ha arable în 1990 and 138 ha in 2011).

Arable lands had an average percentage of 0.4% in 2011 at defile level. Generally, arable lands have very low values in these areas, under 1% (0.1% in Răstolița and 0.2% in Lunca Bradului), the highest value being registered in Stânceni (1.1%).

Within the analysed territory, arable land is fairly limited (268 ha) and divided into small lots, situated in the most favourable areas (meadows, terraces, terraced cones), but the structure of vegetal agricultural production is strongly influenced by pedoclimatic conditions, the number of crops, that can be cultivated, being very low. In 2011, the data shows that the 268 ha of arable lands from the three communes were cultivated primarily with potato (46.6%), followed by corn

(43.0%) and vegetables (9.3%), these crops representing 98.8% (265 ha), the 3 ha arable land (1.1%) difference being the plots occupied by fodder plants (alfalfa, clover), plus those lands that are not cultivated (fallow).

Due to the humid and cold climate, *the potato* is the main crop, the planting taking place late, starting in the first weeks of May, due to frequent late frosts, while the harvest takes place in the middle of September, the predominant breeds being those of autumn. Depending on the climatic conditions and on the spreading of pests like the Colorado potato beetle and potato blight), yields can vary from one year to another (2 020 t/year in 2011), potato crops being found in every corner of the analysed unit, occupying a surface area of 125 ha (65 ha in Stânceni, 38 ha in Lunca Bradului and 22 ha in Răstolița), the largest yields being found in Stânceni (1 000 t/year), followed by Lunca Bradului (620 t/year) and Răstolița (400 t/year).

Corn, of secondary importance, occupies a surface area of 115 ha (43.0% of the entire arable land), average production reaching 120 t/year, mostly found in Stânceni and Lunca Bradului communes.

Vegetables (25 ha, 9.3% of the arable land) are used exclusively for household needs, registering average productions of over 70 t/year. Regarding the main categories of cultivated vegetables, there are *eatable root vegetables* (carrot, parsley, radish, celery, red beet, turnip for fodder), *bulb vegetables* (onion, garlic), *pod vegetables* (beans, peas), followed by *white and red cabbage*, *pumpkin* and *cucumbers*, *lettuce and spinach*, *tomatoes*, *peppers* and *eggplants*, cultivated on smaller lots, mostly in greenhouses.

Pomiculture, found only in local households, encompasses plum trees, apple trees, pears, cherry, the year 2011 registering productions of 130 t/year in Răstolița, 50 t/year in Stânceni and 30 t/year in Lunca Bradului.

Pastures and hayfields

In terms of spatial distribution, *pastures and hayfields* are the most important agricultural usage of this area, representing 21.2% (14 860 ha) of the total land fund of the area, pastures with 16.5% (11 559 ha), while hayfields 4.7% (3 311 ha).

Pastures are found on depression borders as well as in the high mountain areas, in deforested areas, made of succulent grass, with high nutrition value, but with a short vegetation period (roughly 5 months/year). During the last years, local councils auctioned the concessions of pastures, based on demands from the local organisations and associations, for a better management and usage of these lands. This was done according to the legislation in effect (Law no. 214/2011), for a period of minimum 10 years and an optimal animal load per hectare, more than 0.3 LCU/ha. The pastures that were given to animal owners, or to local organisations and associations of animals owners, can be used only according to pastoral and forestry-pastoral arrangements, made by the Ministry of Agriculture or by the Ministry of Environment and Climatic Changes. There are a series of grant based activities introduced for the development of the soil's production potential, such as: shrub clearing, tree screens, zoopastoral constructions, creating and maintaining drinkable water sources, water stream regularization, land improvement works, etc., all with the same goal: improving and expanding the pastoral domain.

At administrative level, pastures have a balanced distribution among communes, 14-19%, the exceptions being lower values in Stânceni (14.2%, 1 768 ha) and Lunca Bradului (15.3%, 4 759 ha), and higher in Răstolița (19.0%, 5 032 ha).

Hayfields, with a more restricted distribution, can be found in the depressions' hearths, on the swampy meadows of Mureș River and its tributaries, on terraces and depression rims, and also in mountain areas, due to large deforestations. Mowing and hay preservation are generally performed by the locals, starting in June (first on meadows and terraces).

There are two or three mowings per year, but in order to obtain good yields per hectare, these lands require constant care and manure.

In Răstolița and Lunca Bradului, the percentage of hayfields is very low (2.1%, 570 ha, and 3.4%, 1 074 ha), while Stânceni has higher values (13.4%, 1 667 ha).

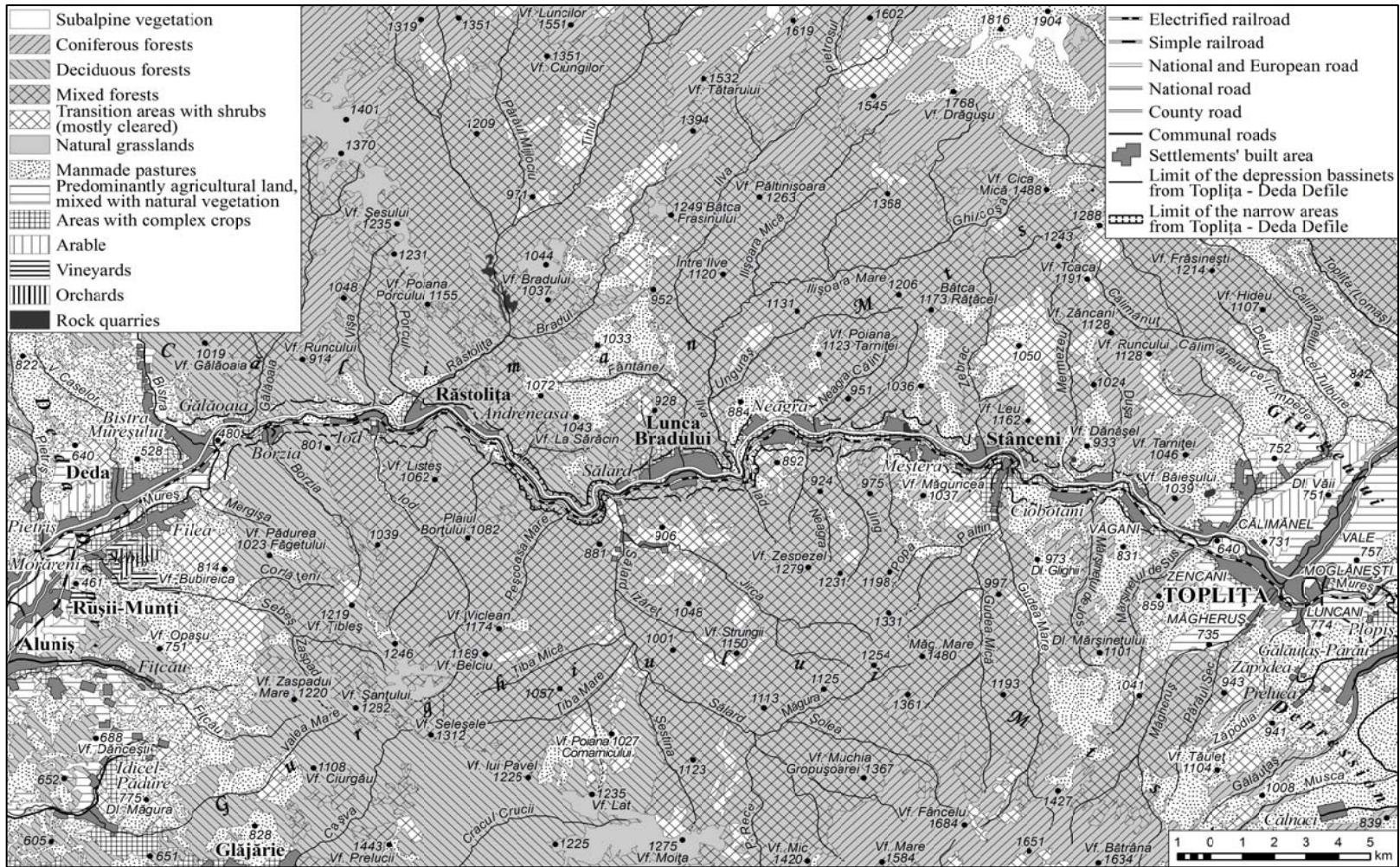


Figure 2. Mureș Defile. Land usage map (after, Corine Land Cover 2006, author G. B. Tofan, 2013)

Table 1. Land fund surface according to usage, in hectares (2011)
(Source: National Institute of Statistics)

No.	Settlement	Arable lands	Pastures	Hayfields	Agricultural total	Foresta and other forested surfaces	Water	Communication routes	Construcții	Barren lands	Non agricultural total	Total
1	Stânceni	138	1768	1667	3573	8568	49	54	67	145	8883	12456
2	Lunca Bradului	80	4759	1074	5913	24456	80	97	108	379	25120	31033
3	Răstolița	50	5032	570	5652	20364	73	66	61	382	20946	26598
TOTAL		268	11559	3311	15138	53388	202	217	236	906	54949	70087

Animal husbandry and production

According to the research of L. Someșan (Viața umană în regiunea Munților Călimani, 1938), the chapter dedicated to economic activities also contains several aspects regarding human life in Mureș Defile, which clearly presents animal husbandry (cattle and sheep) as a secondary activity, because ever since the second half of the 19th century, logging and industrial rafting have had a tremendous development. Currently, animal husbandry represents the most important agricultural activity of the area, compensating for poor plant cultivation. The former enjoys extended pastures, which enables us to generalise and affirm that there is no household without cattle and sheep, alongside poultry and other small domestic animals.

Therefore, in Mureș Defile, in 2012, one could find the following: 596 cattle, 470 pigs, 3 750 sheep, 660 goats, 265 horses, 7 704 poultry and 45 bee families.

a) Cattle raising, registered, in the last few decades, a significant decrease, as in 1990 there were 1015 cattle (6.5 cattle/100 ha agricultural land), while in 2012 density fell to 4 cattle/100 ha agricultural land (596 cattle), all of them being found in local households.

Cattle can be found in every commune of the area, with several differences regarding their density (Stânceni 9.8 cattle/100 ha agricultural land, Lunca Bradului 2.5 cattle/100 ha agricultural land and Răstolița 1.6 cattle/100 ha agricultural land).

b) Pig farming, with 470 pigs in 2012 (175 /100 ha arable land), has followed a descending trend since 1990, when their density was 423 /100 ha arable land (1 172 pigs). Pigs are raised by the locals for their own consumption. In terms of animal density, the lowest value can be found in Lunca Bradului (157 pigs/100 ha arable land), followed by Stânceni (168 pigs/100 ha), while the highest can be found in Răstolița (224 pigs/100 ha), which possesses only 80 ha arable land.

c) Sheep husbandry is the most important within the defile, as in 2012 there were 3 750 sheep (24.7 sheep/100 ha agricultural land), 1 074 sheep less than 1990 (31.1 sheep/100 ha). At settlement level, Stânceni has the highest number (41.1 sheep/100 ha agricultural land), followed by Lunca Bradului (21.6 sheep/100 ha) and Răstolița with 17.7 sheep/100 ha agricultural land).

d) Goat husbandry, with 660 goats in 2012, a 100% private enterprise (4.3 sheep/100 ha agricultural land). Most goats belong to the *Banat White Goat* variety plus a small number of *Angora goats*. The highest density is found in Stânceni commune (6.5 sheep/100 ha agricultural land), then in Răstolița (6.2 goats/100 ha agricultural land), while the lowest in Lunca Bradului (1.3 goats/100 ha).

e) Horse raising is crucial due to the usage of horse traction for different agricultural and non-agricultural activities. In 2012, their number reached 265 horses (1.7 /100 ha), most being found in Lunca Bradului (125 horses, 2.1 /100 ha), and the lowest in Răstolița (30 horses, 0.5 /100 ha).

Table 2. Number of domestic animals (2012)
(Source: Mureş Department for Agriculture)

No	Locality	Cattle	Pigs	Sheep	Goats	Horses	Poultry	Bee families
1	Stânceni	352	232	1469	231	110	2500	10
2	Lunca Bradului	153	126	1279	77	125	2700	15
3	Răstolița	91	112	1002	352	30	2504	20
TOTAL		596	470	3750	660	265	7704	45

f) Poultry farming is represented by 7 704 birds in 2012 (2 874.6 /100 ha arable land), also decreasing since 1990 (11 526, 4.161 /100 ha). In terms of territorial distribution, their values range between 2 500-2 700 birds.

g) Beekeeping is limited due to less favourable climatic conditions (longer and colder winters) and the lack of proper vegetation, this activity being poorly represented, almost nonexistent. For example, in 2012, there were only 45 bee families.

h) Pisciculture is represented by *trout farming*, with fisheries in Tihu (Răstolița) and Gudea (Stânceni), as well as the modern complexes of Sălard (Lunca Bradului), with high quality water for the rainbow trout, also known as the American trout (*Salmo gairdneri Richardson*) and the common trout (*Salmo trutta fario*).

The latter have production capacities of 15-20 t/year, the average capitalisation weight of a trout being 250 g/piece.

Animal production went through different evolutions during the last period. The *average live weight of animals for slaughter*, in 2012, was around 210 t, for pork, mutton, poultry and veal. *Milk production* varies depending on the number of animals, in 2012, for example, reaching 12 379 hectoliters, a value that is far from reality if one adds 20-30%, considering the milk used inhouse.

The largest yields are in Stânceni (6 288 hl) and Lunca Bradului (3 891 hl). *Wool production*, in 2012, was roughly 5 400 kg, sold at very low prices. *Egg production*, in 2012, was 954 thousand eggs. *Sheepherding* is the main activity for a few inhabitants, and is based on mountain cotes, used only in summer, and cotes found within the villages. The development of sheepherding in this area owes a great deal to the geographical position of these localities, at the foothills of Căliman and Gurghiu mountains, which offered hospitable conditions and rich vegetation, especially on southern and southeastern slopes, thus enabling a continuous expansion of the pastoral economy (Mara & Mara, 2004).

FORESTS

They represent the largest land usage category in terms of territorial distribution (76.2%, 53 388 ha). Prior to the First World War, over 90% of this area's forests belonged to Bánffy and Kemény as well to Toplița, Stânceni, Filea, Aluniș and „*Silvicultura Ardeleană*” enterprises.

Following the agricultural reform of 1921, many pastures and forests were given to the surrounding communes, thus decreasing the barons' properties (roughly 75%), enterprises (around 15%) and small owners (roughly 10%), a situation that lasted until 1948 (the Nationalisation Act), when forests became state property, a good of the entire people, thus creating the premises for a rational and unitary management of these areas by forestry departments (Netea, 2006).

Until nationalisation, there had been massive deforestations in more accessible areas, while elsewhere only trees 30 cm in diameter were cut down, thus extracting valuable trees. The areas that had been fully deforested, were then planted mostly with spruce, while small areas had real potential for natural regeneration. Following these deforestations, the current spruce forests emerged, older at the base of the mountain, and mixed high in the mountains (spruce, fir, beech).

In 1948, the *Lunca Bradului Forestry Department* was established, with a surface area of 33 027.7 ha, extending on two communes (Stânceni and Lunca Bradului), while, an year later, the first unitary arrangement emerged. In time, the establishment of production units as well as forestry departments continuously changed in 1959, 1969, 1973, 2000.

Currently, the forests of Lunca Bradului department (34 844 ha), situated on both sides of the river Mureș, from an administrative perspective, are divided into six production units (PUs), bearing the name of the water streams in the area: *Ilva*, *Ilișoara*, *Neagra*, *Sălard*, *Zebrac* and *Gudea*, PUs ascribed to five forestry departments and 29 forestry cantons, with 241.7 km of forestry roads, and an accessibility of 90%. Out of the total forest surface of 34 844 ha, the largest part belongs to the State (71.2%, 24 806 ha), followed by administrative-territorial units (12.8%, 4 455 ha), legal persons (11.5%, 4 023 ha) and private properties of individuals (4.5%, 1 560 ha).

In terms of *the indicators characteristic for forest structure*, the *species composition* is as follows: 80.0% softwood, 18.0% beech, 1.0% oak and 1.0% other species; *age class structure*: 1-20 years (6.0%), 21-40 years (16.0%), 41-60 years (15.0%), 61-80 years (21.0%), 81-100 years (26.0%) and over 100 years (16.0%); *functional groups percentage*: Group 1 - protection forests (21.1%) and Group 2 - forests with protection and production functions (78.9%); *average volume per hectare*: 376 m³/ha; *annual average growth*: 8.0 m³/ha.

The second forestry department of Mureș Defile is the one in *Răstolița*, whose administrative surface is 28 776 ha, out of which 72.7% (20 927 ha) is owned by the State, 15.5% (4 461 ha) by administrative-territorial units, 10.5% (3 020 ha) by compossessorates with legal associations, 1.1% (331 ha) by religious organisations and 0.2% (37 ha) by individual persons. Within *Răstolița Forestry Department*, a forest surface area of 5 573.8 ha is part of the Călimani National Park, out of which 1 138.8 ha is a special conservation area. In terms of species composition, softwood predominates (66.0%), followed by beech (32.0%) and other species (2.0%), while age class structure emphasizes percentages higher than 20.0% for trees aged between 81-100 years, over 100 years and 41-60 years, while younger trees, between 1-20 years, represent only 9.0%. Protection and production forests reach a percentage of 68.0%, while protection forests 32.0%, the average volume per hectare being slightly lower than the one found in Lunca Bradului Department (316 m³/ha). The annual average growth is 7.1 m³/ha, while the access to the area is through 200.5 km of forestry roads, with an accessibility of roughly 83.0%.

Following the situation of the forestry fund, at administrative level, one can see that the largest surfaces can be found in Lunca Bradului Commune (78.8%, 31 033 ha), followed by *Răstolița* (76.5%, 20 364 ha) and *Stânceni* (68.8%, 8 568 ha).

In terms of *game economy*, the forests surrounding the depressions have important game resources, such as *deer*, *bear*, and *wild hog*, plus two valuable bird species, *Tetrao urogalus* and *Lyrurus tetrix*, the defile containing three game funds and five fishing funds.

WATERS, PONDS AND OTHER SURFACES

Within Mureș Defile, these categories have 2.2% (1 561 ha), *waters and ponds* with 0.2% (202 ha), while *other surfaces* (communication routes, constructions and barren lands), 1.9% (1 359 ha).

Water streams and ponds are mainly represented by Mureș and its tributaries, as well as by lakes, such as „*Răstolița Lake*” with its *hydroelectric plant*, that taps into the hydraulic potential of right side tributaries of Mureș River, along the *Ilva-Răstolița-Bistra* sector. The extension of these areas is rather poor, below 0.5% (*Stânceni*, 0.4% with 49 ha, *Lunca Bradului*, 0.2% with 80 ha and *Răstolița*, 0.2% with 73 ha).

Other surfaces category reaches 1.9%, (1 359 ha) of the total land fund of the defile (70 087 ha), encompassing *roads and railways* (0.3%, 217 ha), *built up areas* (0.3%, 236 ha) and *unproductive surfaces* (1.3%, 906 ha).

In terms of the surfaces occupied by roads (European/national, communal and forestry), all communes register very low percentages, below 0.5% (*Stânceni*, 0.4% that is 54 ha, *Lunca Bradului*, 0.3%, 97 ha and *Răstolița*, 0.2%, 66 ha).

The lands occupied by *built up areas* follow a similar trend (Stânceni, 0.5%, 67 ha, Lunca Bradului, 0.3%, 108 ha and Răstolița cu 0.2%, 61 ha).

Barren lands (rock outcrops, areas with accelerated erosion, parts of Mures' flood prone meadow, etc.) register 1.3% (906 ha) of the defile's land fund, with very similar percentages, below 1.5% (Răstolița, 1.4%, 382 ha, Lunca Bradului, 1.2%, 379 ha and Stânceni with 1.1%, 145 ha).

OTHER ACTIVITIES OF THE PRIMARY SECTOR

Besides logging and animal husbandry, a part of the defile's inhabitants are involved in seasonal activities, such as foraging (forest fruit, eatable mushrooms, etc), thus providing additional, if modest, income during summer, their capitalisation taking place in the existing collection centers from the three communes (Stânceni, Lunca Bradului, Răstolița).

INDUSTRIAL ACTIVITIES

Extraction industry

This is represented by the exploitation of nonmetallic resources (andesite) from Meștera and Ciobotani (Mermezeu Valley), used mostly for roads and in constructions, etc. The quarry of Meștera had been owned by the State until 1995, then it became the property of *Hamerock S.A* from Miercurea-Ciuc, which later merged with *Lafarge Agregate Betoane S.A.*, while in 2004, the andesite quarry was acquired by *Hodaco Prodcompex*.

Situated on the right bank of Mureș River, 15 km from Toplița, with access to DN 15, the exploitation perimeter has a surface area of roughly 12 000 m² (the quarry, the dump, the crushing plant, the administrative building, mechanical shop and power station). The first phase includes evacuating the waste composed of soil and altered andesite, which is stored separately to be used in other works. The used exploitation method is the one involving descending horizontal steps by drilling-exploding (placing explosives in drill holes).

The useful rock is transported through interior semitrenches that are grouped at the end of the steps, then loaded into trucks and shipped to the crushing-processing station (crusher with C 129 jaws), where the waste is separated and transported to the dump by conveyor belt, the processing station having a capacity of 80-100 t/hour.

The electricity is provided by the 20 kV network belonging to the national system, through a 20/0,4 kV 630 kVA transformation station.

The geological reserve set to be exploited annually is 105 000 t (5 000 t are extraction losses and 8 000 t are processing losses).

The products resulted from the Meștera quarry are: crushed sand - type 0-4 mm (15 000 t/year), chippings type 4-8 mm (7 000 t/year), chippings type 8-16 mm (30 000 t/year), crushed rock type 40-63 mm, 0-63 mm, 25-63 mm (20 000 t/year) and brute rock (20 000 t/year).

Ever since the 1970s, Mermezeu Valley had hosted a quarry (6 ha), which was closed in 1997. *Hodaco Prodcomex S. R. L Stânceni* received the licence for this quarry in 2004, allowing it to exploit andesite for 14 years, approximately the time for which the resources had been homologated. In 2013, the licence for the Mermezeu site was awarded to *Andezitul Stânceni S.R.L*, headquartered in Târgu-Mureș, Mures County.

The exploitation perimeter is 20 000 m² and is situated outside Ciobotani village, hosting an andesite crushing-processing installation, with a similar capacity to the one in Meștera.

There is also a rockfill quarry (andesite) on Răstoliței Valley, extending on 120 000 m², providing construction material for concrete and aggregate preparation at the Răstolița Dam.

Electric energy industry

The construction of „*Răstolița Hydroelectric Complex*” started in 1989 by *Hidroconstrucția S.A Ardeal*, being the only hydroelectric dam on Mureș River. In order to fit every component of the Răstolița complex, a surface area of 210.4 ha was needed, situated on the administrative territories of Răstolița, Vătava and Lunca Bradului communes. However, the

establishment of the Property Law made the usage of all the lands necessary for the investment impossible, which meant that the Rostoliţa Complex had to be declared a public utility of national interest. On 10th May 1996, through Government's Decision no. 332, the complex was finally declared utility of national interest, while on 21st June the new technical-economic indicators were reestablished. Therefore, according to the energy optimal variant, approved by Decree 489/1996, the total value was 148 715 thousand old lei (without VAT), out of which 70 221 million lei for energy usage, and 78 494 lei for water.

The installed power (MW) and the produced and delivered electric energy (GWh/year), approved by Decree 95/1989, were reduced (from 50.4 MW to 35.2 MW, and from 123.4 GWh/year to 117.5 GWh/year produced energy and from 122.3 GWh/year to 116.5 GWh/year delivered energy), due to the modification of the installed flow from 25 m³/s to 17 m³/s, and due to a reduction in the number of functioning hours for Răstoliţa hydroelectric plant during the average hydrological year, as one can also see in the production costs for delivered electricity (from 25.71 lei/kWh to 24.61 lei/kWh).

In 2003, according to Government's Decision no. 424, „*Răstoliţa Hydroelectric Complex*” is transferred to *S. C. Hidroelectrică S. A.* The registered physical stages at the beginning of 2012 enabled the commissioning of this site, at minimum energy level (stage I), in the IVth trimester (April), the normal retention level being 720.00 mdM, capable of gathering 10 million m³ of water, the main pipe being through an underground tunnel, 8.52 km in length and 3.5 m in diameter. In terms of the pressure node, it is composed of a balance castle (the shaft of castle being 76 m long), while the house of the butterfly tubs and the pipe being 685 m long and having an average diameter of 2.2 m.

Răstoliţa powerplant, type plant with pressure deviation), semiburied, (the underground part being the assembly hall and the machine room), has two vertical Francis turbines with concretelad aspirators, with 35.2 MW, the installed flow being 17 m³/s, with a 270 m drop.

The downstream compensating basin, with a volume of 100 000 m³, 80% complete, enables the rectification of flows in Mureş River, focusing on erosional stability of the downstream valley.

During the second construction stage of Răstoliţa, which will take place in 2014-2018, the retention level will reach 760.00 mdM, the total volume of the lake being 43 mil m³, out of which 40 million m³ useful volume, plus two secondary pipes (*the eastern wing*, with an underground tunnel 5 km long, which act as intakes for Ilva Mare and Bradu streams, and *the western wing*, comprised of a 9 km tunnel, for Vişa, Gălăoia Mică, Gălăoia Mare and Bistra streams).

The dam is a homogenous type, made of *rockfill* with a concrete mask on the upstream face, with a 1:1.5 slope on both sides. The heavy water unloader has a tunnel on the left slope, continued by a concrete section. The dam's sealing is concrete, with a surface area of 84 000 m² and a volume of 42 000 m³. The total length of the main duct is 8 525 m (Castel-Vişa section has 3 300 m, while the Vişa-Priză section has 5 225 m).

To sum up, „*Răstoliţa Hydroelectric Complex*” is of crucial importance for the area, contributing to the regularization of Mureş river and preventing flooding; providing water for a large number of inhabitants; an installed power of 35.2 MW, with a production capacity of almost 117.5 GWh/an; tourism, etc.

Logging industry

Logging is very well represented in this mountainous, wooded, area. In the past, the main economic activity, besides animal husbandry, was *industrial rafting*, which started in the 13th century. In the second part of the 19th century, after the events of 1848, it prospered alongside logging, reaching its peak in 1922, when, between Topliţa and Reghin, 155 400 m³ of wood were transported solely on rafts (Someşan, 1933, 1938).

Rafting was also used on some of Mureş' tributaries (Topliţa, Călimănel, Sălard, Bistra), when in 1856, a group of Italians from South Tyrol regularized these streams. This was followed by the establishment of *rafting enterprises in Reghin* („*Compania săsească*”, 1865) and *Târgu Mureş* (1877) (Rus, 2000).

Stânceni was one of the most important rafting centers of the area, Count *Lázar Moricz* having established on Gudei Valley, ever since 1840, several woodmills, where workers from Deda, Filea, Dumbrava were employed, etc, some of them settling in the above mentioned village. Among the settlers, there were several carpenters from Transilvaniei Plain and Apuseni Muntains, who were named *Butnari* due to their activity.

Once roads and industrial railways began to appear (*Ofa*, *Lomaş* and *Foresta*), rafting vanished, some of the rafters finding work in the sawmills of Lunca Bradului, Răstolița, Deda-Bistra (Bistra Mureşului), Deda and Reghin. During the third decade of the 20th century, logging goes through an even larger boom, as corporations begin to enter the logging business. For example, in Lunca Bradului, on Sălardului Valley, the forest was logged by „*Reghinul Săsesc*” enterprise, belonging to *Foresta Chain*, controlled by the Commercial Italian Bank, from Milan. There was also „*Branga*”, created through the association of Bánffy, with Cratzel from Austria, a company that also logged the forest of Ilvei Valley.

The first sawmill in Lunca Bradului was built by the Italian *Giacomuzi*, on Ilvei Valley, the mill operating between 1872-1878. Shortly after the construction of the national highway, in 1890, the sawmill of Lunca Bradului was established, with four station logs, by the successors of *Mendel Schwartz*, who owned forests on Mures Valley. In 1908, the mill burnt down and, in 1909, an anonymous company from Viena, owned by *Grassl and Schenk*, fitted the mill with six logs.

In 1909, *Smilovitz Tarse* built a new mill, with 10 logs, later acquired by *Goldfinger Teplansky*, then by *Reghinul Săsesc*, the mill's production during 1909-1910 being 100 000 m³ of wood, while between 1911-1927, over 800 000 m³.

The mill from Lunca Bradului was owned in 1918 by the *Bánffy family* (40%) and *Gheorghe Grassl* (60%), this association being renamed *Bangra*, headquartered in Viena, funded by the Laendler Banking Institute of Viena, while the mill was fitted with 10 stations, four of them being new.

During the retreat of the German army, in 1944, the mill from Sălard was completely destroyed, while the factory of Lunca Bradului was damaged, and later rebuilt and fitted with four stations.

Until 1940, the largest amount of wood was exported to Egypt, Siria, Palestine, while in 1941-1944, the mill delivered materials to the German army. After 1950, the products of this mill (wood, crates, etc) started being exported to the Soviet Union, Hungary, Poland, etc, as well as shipped for internal uses.

1985 is the year when the new mill was inaugurated, situated on the left bank of the River Mures, fitted with a brand new logging station, with a capacity of 7 000 m³ logs/ month, resulting over 3 500 m³ of wood, more than half being shipped abroad. Initially, the mill had a staff of 100 employees, being fitted with two semiautomatic lines, each with two stations. The timber storehouse had two cranes, with 32.5 m openings, with which one forestry autotrain could be unloaded in roughly 10 minutes. Wood transport from the source to the mill was done by *U.M.T.F (Unitatea Mecanizată de Transport Forestier)*, established in 1980.

With the emergence of private companies, the competition on the logging market increased, and the mill, without sufficient raw material, fell into debt, eventually leading to its bankruptcy and closure in 1998. The same year, the mill was privatised and the shares acquired by *S.C. Davi S.R.L Oradea*, which did not manage to reopen the plant (Clineag, 2003).

Currently, all the settlements of the defile host small mills, focused on the processing of wood from the surrounding forests, while in Lunca Bradului there is a company specialised in creating wooden doors and windows for termopan, as well as an enterprise producing fir oil.

Mineral water bottling industry

The hydromineral deposit of Stânceni is situated on Mermezeu Valley, roughly 6 km upstream of its confluence with the Mureş River, at an altitude of 800 m, in a forested area, far from any human activity. In its natural state, Stânceni mineral water is sparkling, the aquifer being fed by the infiltration of rain water to a depth of roughly 200 m, where the mixture with carbon dioxide takes place, the latter being a post-volcanic manifestation (Feru, 2012).

The construction of the plant began in 1975 by the *Group of Local Industry Enterprisers of Mureş County*, and the inauguration took place two years later, and was handed to *Reghin Beer Enterprise*. It used a German BF-36 line, with a capacity of 36 000 l/day.

In 1989, through an investment by the *Reghin Beer Enterprise*, a new bottling line was purchased, made by *Tehnofrig Cluj-Napoca*, with a production capacity of 4 200 l/hour, that is approximately 100 000 l/day. Following a Government's Decision regarding the taking over of the mineral water extraction and bottling, *Reghin Beer Enterprise* gave up the plant, in 1990, in favour of the *Borsec Mineral Water Extraction Company*, belonging to the *Ministry of Industry and Raw Materials, the Geological Sector*. In 1997, the company was redefined and renamed as *S.C. Romaqua Group S.A.*, still owning the unit from Stânceni as a bottling station (work station).

In 2005, it was decided that a new plant had to be built, one that would meet the legal requirements in terms of environmental protection and food safety, the unit being situated in Ciobotani village, owned by *S.C. Romaqua Group S.A.*, which transformed the Stânceni local brand into a national one.

The new location is situated closer to the water source and closer to the highway, and was operational in 2006, with a new production capacity of 300 000 l/day, with new lines for plastic bottles PET (0.5 l and 2 l), these flasks being made with the help of *Krupp Corpoplast machines*.

This unit also hosts the old *SIG Simonazzi* bottling line from Borsec, which enables the bottling, during summer, of over 1.5 million l/ month. Stânceni mineral water is *hydrogen-carbonated, calcic, magnesian, sodic*, enriched with artificial CO₂, alongside natural CO₂, having a low, but balanced mineralisation, being the only oligomineral water among the sparkling natural mineral waters (Pricăjan & Airinei, 1979).

Currently, the mineral water of Stânceni is known and appreciated at national level for its curative properties as well as for its distinguished taste.

Other industrial branches

This category is comprised of a series of less important units, such *the bakeries of Stânceni și Răstolița, finances and banking* (CEC Bank), plus small *barber shops, hair salons, beauty salons, private taylor shops and handicraft* (ironworks, milling, carpentry).

COMMUNICATION ROUTES AND TRANSPORTS

The communication routes of Mureş Defile fit into three categories: roads, railways and special (aqueducts, powerlines, postal services and telecommunications).

The road network is mainly represented by the highway connecting Transilvania and Moldova (Turda-Bacău), running through (starting from Reghin) Deda-Răstolița-Lunca Bradului-Stânceni-Toplița (towards Borsec), part of DN 15 national road (started in 1880). The above mentioned road is also the European designated road *E 578* (Sărățel-Reghin-Toplița-Gheorgheni-Miercurea Ciuc-Sfântu Gheorghe-Chichiș), a secondary axis that connects E 58, E 60 and E 81.

After 1989, the constant decrease in investment for the modernisation and upkeep of this road, corroborated with 10 times increase of heavy traffic on this sector, led to its decay. That is why, in 2010, the necessity of its rehabilitation became paramount. DN 15 with DN 15 A (Reghin-Sărățel) ensures the connection with DN 13 (Târgu-Mureş-Sighișoara-Braşov) and DN 12 (Toplița-Gheorgheni-Miercurea Ciuc-Sfântu-Gheorghe) and also for DN 17, through Tihuța (1 200 m) and Mestecăniș (1 096 m) passes (Dej-Beclean-Bistrița-Vatra Dornei-Câmpulung Moldovenesc-Gura Humorului-Suceava), DN 17 C, a secondary road that crosses Rodnei and Țibleș Mountains, through Dealul Ștefăniței Pass (818 m), connecting Bistrița and Vișeu de Sus, and DN 17 D, through Rotunda Pass (1 271 m), connecting Beclean-Năsăud-Sângeorz-Băi-Cârlibaba.

On the 33 kilometers that cross Upper Mureş Defile Natural Park, the road's cross section was reduced to 8 m, out of which 7 m are for the carriageway (2 x 3.5 m) plus the banks (2 x 0.5 m).

On the Bistra Mureşului-Vâgani sector 11 bridges were built and modernised, most of them crossing streams situated close to their springs, or in settlements and close to the confluence with

Mureşul (the bridge at km 133+391 crossing Deda-Bistra valley; bridge at km 133+958 over Valea Bistra; Podul km 135+456 over Braţ Gălăoia la Răstoliţa; new bridge at km 135+643 over Gălăoia; bridge at km 140+888 over Răstoliţa; bridge at km 145+311 over Androneasa; bridge at km 150+370 over Biserica at Lunca Bradului; bridge at km 152+308 over Fântânelul; bridge at km 154+133 over Ilva; bridge at km 163+654 over Zebra at Stânceni and bridge at km 167+312 over Mermezeu).

Communal and forestry roads are part of the local importance category, present mainly along the tributaries of Mureş, frequently used by the locals, and extremely damaged, which translates into difficulties in terms of access to basic education and healthcare services.

When it comes to the development of short distance and medium capacity public transport, the main mean of transport is the minibus, which continuously gains ground at the expense of large buses and coaches, due to a decrease in passenger numbers and an increase in automobile ownership. This type of transport is provided by five operators, which are companies that own licences for transiting the defile.

The railway network is represented by *thoroughfare 400*, belonging to Braşov Regional, Deda-Gheorgheni section, operating since 1909, and fully electrified. In the spring of 1907, the Hungarian State Railways (MAV in Hungarian) started the construction of a simple line, with a length of 77 km (Deda-Gheorgheni).

Constructions began from west to east, passing through Răstoliţa, Lunca Bradului, Stânceni and Topliţa, where an intense logs, timber and mineral water loading activity took place (transported to the loading container station of Topliţa, from Borsec, on the narrow railway line (760 mm) belonging to the former Apemin Borsec).

The Second World War led to the destruction of the terraces and rails of this line. In 1947, after Deda-Sărăţel had been reinstated, the act of establishing Deda station was signed. The decision was that the name of Deda station, situated on the Ciceu-Târgu Mureş line, between Răstoliţa and Aluniş, would be changed to Deda-Bistra, while Deda stop, situated between Deda-Bistra and Aluniş, would be upgraded to station status, a ramification point for the Deda-Sărăţel line.

After their openings, Deda and Topliţa were modernised in 1961, 1971, and 1974, in preparation for the electrodynamic centralisation and electrification. Besides the above mentioned stations, I would also like to point out the existence of Deda-Bistra, Androneasa, Stânceni-Negra, Stânceni-Meştera and Ciobotani stops.

At the Sălard narrowing, a tunnel had to be built (km 208+743-209+137), with a length of 800 meters. From Deda, a secondary, non-electrified railway (405), connects Reghin-Târgu Mureş-Iernut-Luduş-Cheţani-Războieni, thus insuring the linkage with artery 300.

Deda-Sărăţel railway, 47 km long, electrified, was built between 1941-1942, ensuring rail connections between south-eastern and north-western Transilvania.

Should one examine rail transports between Topliţa and Deda, for a 22 year period (1990-2012), he/she would see a considerable decrease in the number of passengers by almost 80% (419 473 passengers in 1990 and 88 035 passengers in 2012).

Table 3. Passenger numbers at the railway stations of Mureş Defile, in 1990, 1995, 2000, 2005 and 2012

(Source: Archives of Topliţa, Stânceni, Lunca Bradului, Răstoliţa, Deda stations)

No.	Railway station	Number of passengers				
		1990	1995	2000	2005	2012
1	Topliţa	161000	134000	72000	48600	29300
2	Stânceni	12400	9600	6100	2900	1300
3	Lunca Bradului	48000	33900	26500	14400	8700
4	Răstoliţa	45820	42631	34148	16453	8856
5	Deda	152253	129649	67593	45689	39879
TOTAL		419473	349780	206341	128042	88035

The precarious infrastructure led to speed restrictions and to a spike in the time spent travelling, which eventually caused a drop in the number of passengers, many resorting to road travel, thus shortening their voyage, especially when buses and coaches are more frequent and even cheaper than travelling by rail.

The most important railway stations are at the ends of the defile, one being *Toplița*, which, in 1990, registered the highest number of outgoing passengers (161 000 people), followed by a continuous decrease, more pronounced between 1995 and 2000 (62 000 passengers less), the other being *Deda* (152 253 passengers in 1990 and 39 879 in 2012), with a descending trend even today, due to the unstable social and economic situation at national level, with direct repercussions such as lower incomes, rise in unemployment, etc., as well as an increase in automobile owners.

In terms of rail freight transport, in tight correlation with the economic activities in the area, I would like to emphasize the following stations: *Toplița* (timber, mineral water), *Stânceni* (timber, rocks, mineral water), *Lunca Bradului*, *Răstolița* and *Deda* (timber).

The lack of private investment in the last decade, corroborated with the effects of the financial crisis, caused the abandonment of these rail activities in 2012, freight transport now being carried out mainly by trucks, highly mobile, which also enable freight loading directly from the exploitation site and its unloading directly at their destination, without the need for transshipments and supplementary manipulations.

Table 4. The volume and structure of freight loaded / unloaded at the railway stations of Mureş Defile, in 1990, 2000 and 2012

(Source: Archives of *Toplița*, *Stânceni*, *Lunca Bradului*, *Răstolița*, *Deda* stations)

Year	Railway station	Volume of loaded freight (t)	Volume of unloaded freight (t)	Structure of loaded freight	Structure of unloaded freight
1990	Toplița	1530000	4000	Timber + mineral water	Packaging
2000		980000	-	Timber + coal	-
2012		-	-	-	-
1990	Stânceni	490000	-	Timber + mineral water	-
2000		46000	-	Timber	-
2012		-	-	-	-
1990	Lunca Bradului	765000	-	Timber	-
2000		330000	-	Timber	-
2012		84000	-	Timber	-
1990	Răstolița	530000	-	Timber	-
2000		42000	-	Timber	-
2012		-	-	-	-
1990	Deda	1230000	1500	Timber	Miscellaneous
2000		845000	-	Timber	-
2012		-	-	-	-

The water supply network, according to statistical data, can only be found in *Stânceni* (5.3 km) and *Lunca Bradului* (6 km), drinking water being extracted from underground water sources, the quantity of distributed water reaching 200 000 m³, out of which 190 000 m³ is for household usage. The total simple length of the sewage pipes was almost insignificant (2 km) until 2011, causing the pollution of streams and aquifers.

There are groups of households which built their own water supplies and sewage systems, however they do not comply with standard regulations.

The power supply network was first introduced in 1970, the distribution of electricity being managed by *S.C. FDFEE Electrica Transilvania South S.A.*, through its *Târgu Mureş Distribution*

and *Supply Branch*. The electricity needs of the consumers from all settlements of the defile are carried out by medium and low voltage powerlines (60 and 35 kV).

The postal network, fully covering all the communes (Rural Postal Offices), organised to carry out diverse postal services (processing before delivery, arrival processing and distribution).

The telecommunications network made astounding advancements, *the landline network* belonging exclusively to ROMTELECOM, which currently reinvented itself by creating economical telephone, TV and internet packages. When it comes to the *mobile phone network*, the services are rendered by national providers such as Orange, Vodafone and Cosmote. *The radio and TV network* is represented primarily by national public stations (Radio România Actualități, Târgu Mureș Radio Studio, TVR 1 and TVR 2) and also by several private stations (ProFM, Trinitas) and Radio Ardealul, headquartered in Toplița.

Furthermore, one must not omit the cable television network and the digital television systems like DigiTV, Focus Sat and Dolce, which provide several other Romanian and foreign TV stations. The *internet services market* is represented by large national providers (ROMTELECOM, Orange, Vodafone and Cosmote), currently in the middle of an expansion process.

OTHER TERTIARY ACTIVITIES

Trade had experienced a tremendous development ever since the 19th century, with *the commerce of wood*, from the forests belonging to Bánffy, Kemény, Reday, Jesensyky, Lázár, the wood being transported by rafts on the Fiver Mureș, and then by rail.

Wood trade expanded even further after the forests of Giurgeu Depression had been depleted, which led to more strict regulations from the large forests owners (Gociman, 1929).

The intensification of this type of trade played a major role in the territorial social-economic development. In the last two decades, as the logging economy became more disorganized, the value of timber increased, most transactions being made on the black and grey markets, excluding the local authorities from this trade (Tofan, 2013).

Besides wood, andesite and its derivatives (crushed sand, chippings, brute and broken rock) are the second traded goods, which can be used in construction works. Stânceni also is the focus point for mineral water trade, which was expanded at national level in 2006 through dozens of companies specialised in this type of service, that is supplying large customers (key-accounts), using transports owned by Romaqua Group S.A.

Among other products for sale there are forest fruit, mushrooms, milk and dairy, at lower than average prices, which means that, in years with poor yield, this activity is unprofitable.

Agricultural and nonagricultural products are also traded at two weekly rural fairs, (Răstolița, every Friday, and Lunca Bradului every Saturday).

Education fits into normal parameters in all three commune centers, with kindergartens, primary and secondary schools. In 2011, the number of pupils was 436, 185 less than in 1992, plus 207 children enrolled in kindergartens (153 less than in 1992), while staff members reached 46 teachers in 2012, 17 less than in 1992.

Medical services were provided in 2011 by four family doctors, one in Lunca Bradului, two in Răstolița and one with a private practice in Stânceni, and a total of five auxiliary staff (nurses). They provide assistance in three medical units, plus one dentist (in Răstolița) and a pharmacy (in Stânceni), both privately owned.

Even though this area has a rich touristic potential, in terms of economic activity, it is still in its *infancy*. The area encompasses a series of natural and man made touristic resources and sites, plus a poorly developed touristic infrastructure (only eight accommodation units, with 220 beds, in 2012).

CONCLUSIONS

Regarding the structure of the land fund and land usage, depending on the orographic and climatic conditions, I would like to emphasize the fact that forests have the largest territorial extension (76.2%, 53,388 ha), while arable land has the lowest percentages (0.4%, 268 ha), causing the extension

and productivity of agricultural lands to be modest, the main crop being the potato, followed by corn, while vegetables are solely used for household needs. The existing natural pastures and hayfields represent favourable starting points for the development of animal husbandry, especially sheep, which require less care, but provide higher yields in terms of milk, meat and wool. The massive deforestations of the last couple of decades that encompassed almost the entirety of the defile are one of the most profound human interventions on the environment, causing chain reactions for all components. Until recently, the two andesite quarries of Stânceni operated illegally, without any environmental permit, both being situated within Mureş Defile Nature Reserve. The insolvency of S.C. Hidroelectrică S.A delayed the completion of Răstoliţa Dam, a major project for the entire Upper Mureş area, in terms of electricity (116.5 GWh/year), flood control, as well as water provision for the inhabitants of Mureş Defile and the periphery of Transilvaniei Plain (Pop, 2007).

Unfortunately, the massive layoffs (mainly in logging), as well as the lack of alternative jobs contributed to the continuous depopulation of this space, the most disadvantaged population segment in this matter being young people.

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