

INFLUENCE OF SPREADING URBANIZATION IN FLOOD AREAS ON FLOOD DAMAGE

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Abstract

Damage caused by natural disasters in Slovenia is frequently linked to the ignoring of natural factors in spatial planning. Historically, the construction of buildings and settlements avoided dangerous flood areas, but later we see increasing construction in dangerous areas. During the floods in 1990, the most affected buildings were located on ill-considered locations, and the majority was built in more recent times. A similar situation occurred during the floods of September 2007.

Comparing the effects of these floods, we determined that damage is increasing due to the urbanization of flood areas. This process furthermore increasingly limits the “manoeuvring space” for water management authorities, who due to the torrential nature of Slovenia’s rivers can not ensure the required level of safety from flooding for unsuitably located settlements and infrastructure. Every year, the Environmental Agency of the Republic of Slovenia issues more than one thousand permits for interventions in areas that affect the water regime, and through decrees the government allows construction in riparian zones, which is supposedly forbidden by the Law on Water.

If we do not take measures with more suitable policies for spatial planning, we will no longer have the possibility in future to reduce the negative consequences of floods. Given that torrential floods strike certain Slovene regions every three years on average and that larger floods occur at least once a decade, it is senseless to lay the blame on climate change.

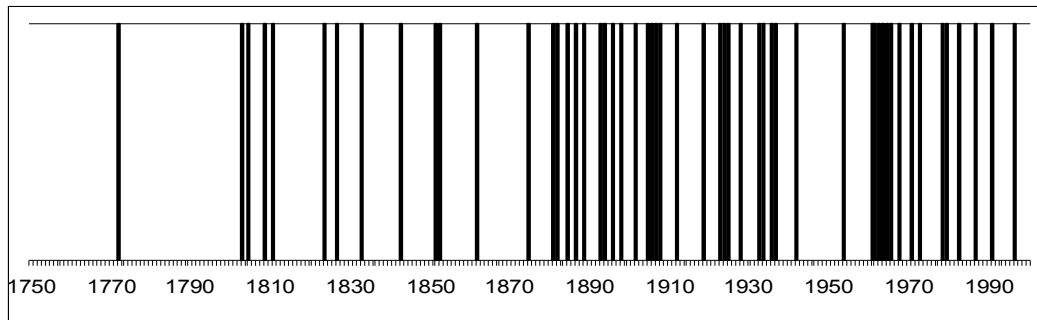
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1 INTRODUCTION

The potential for natural disasters is an important component of landscapes and therefore it is essential to consider this when planning the use of space. Using geographical research methods we can identify the presence of potential natural processes in areas, define their effects on nature and society, and using this information in cooperation with other relevant expert input we can look for possibilities for “coexistence” with them through the instruments of spatial and other forms of planning (Natek, 2008, 148). However, spatial planning is subject to the interests of capital and local communities, and agriculture suffers the blind destruction by urbanization of the highest quality farmland that could produce food in

future crisis periods while at the same time placing ever greater demands on limited natural resources (primarily on water for irrigation).

Figure 1. Occurrence of larger floods in Slovenia (1750–2000).



On the other hand, much has been done in recent years in the field of protecting and safeguarding people and property. Good preparation, effective rescue services, and comprehensive help in dealing with the consequences of natural disasters all reflect the high level of government management, but they cannot be an alternative to preventive action oriented toward preventing or at least mitigating the consequences of future natural disasters.

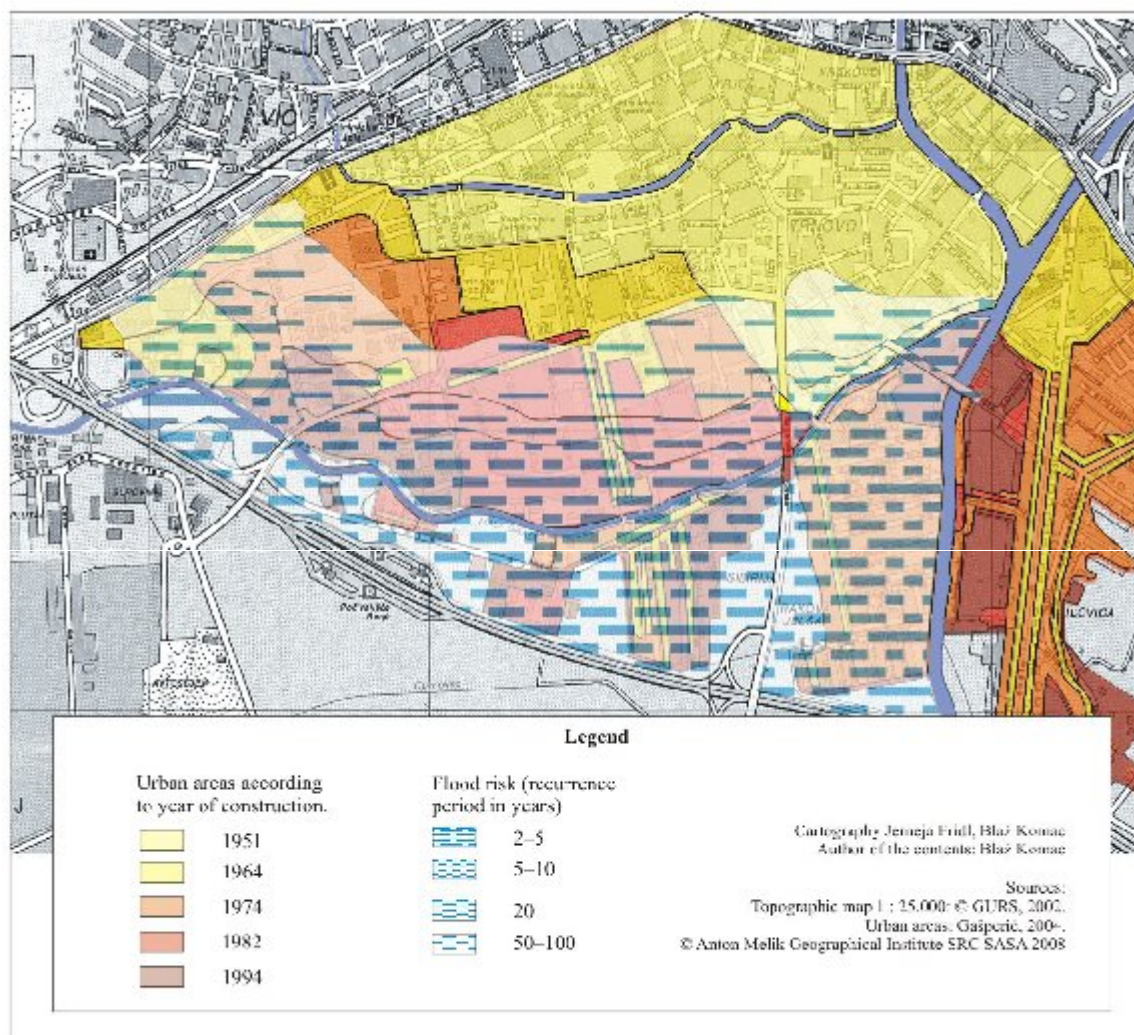
2 PREVENTIVE LIMITATION OF URBANIZATION IN FLOOD AREAS

In the past, settlement avoided dangerous flood areas. However, even before World War II, there were permanent flourmills, sawmills, and similar operations and a handful of flood-threatened settlements in flood areas, but later entire residential neighbourhoods grew in such areas (on the southern edge of Ljubljana the population grew by several thousand to more than 30,000). Major public infrastructure projects were built in dangerous areas that now require protection against flooding. This is a major challenge for water management authorities, but it will never be possible to control all dangerous flooding completely.

Because the ever-increasing pressure from investment and construction in flood areas shows no regard for the threat of future floods or their inevitable intensification due to global climate change, the government should regulate this urbanization through long- and medium-term spatial planning policies and the professional cooperation of the water management authorities.

Declarative references to the paradigm of sustainable development in a transitional society are very frequent. A corresponding approach to “coexistence” with nature is concluded in the *Strategy for the Spatial Development of Slovenia*; however, due to different development priorities, its provisions are not realized in practice. The *Strategy* clearly states, “*Natural processes that can threaten settlement and human activity must be respected as limitations in planning uses and activities in space... Potential risk should be reduced through preventive planning, certainly through the distribution of activities in space outside areas of potential disasters, with appropriate management of primary activities in dangerous and threatened areas, and with the monitoring of activities that can cause natural and other disasters*” (Strategija..., 2004, 30).

Figure 2. In recent decades, Ljubljana has spread southward where flooding threatens a considerable part of the settled area.



A European Union document entitled “Best practice on flood prevention, protection and mitigation” (Najboljše..., 2003, page 6) states, “*It is necessary to support and coordinate the transformation of water policies and the use of space ... that will improve the control of floods in the framework of the overall management of riparian areas.*”

The *National Program of Protection against Natural and Other Disasters* (Nacionalni..., 2002) outlines measures that contribute to greater security and are necessary to consider in spatial planning. The *Law on Water* (Zakon..., 2002) is also quite clear: “*The use and other interventions in water, riparian, or coastal land areas and land in protected or threatened areas ... it is necessary to program, plan, and execute so as ... to provide security from damaging activity of water, the preservation of natural processes, the natural balance of water and riparian ecosystems*” (Article 5). On the basis of these starting points, “*interventions in space are not allowed on water or riparian land [including flood plains] or in the area of periodic lakes,*” except in some explicitly determined cases.

By signing the *Alpine Convention* (Alpska..., 1991), Slovenia has obliged itself to strive for suitable measures in the field of spatial planning, including relative to natural disasters.

In spite of such clear legislation, we can find in Slovenia hundreds of cases of legalized new construction of residential, business, and other buildings on flood areas. This also conflicts with the *Law on Spatial Planning* (Zakon..., 2007), according to which a key goal of spatial planning is “*to enable harmonious spatial development ... in the fields ... of protecting natural resources and defence and safety from natural and other disasters*” (Article 3).

This lack of respect for the legislation is unacceptable from the viewpoint of sustainable development or environmental ethics, since “*spatial planning should not look merely at satisfying the needs for space of the existing society but also must from the viewpoint of environmental ethics consider intergenerational responsibility*” (Plut, 2005, 62).

A lack of consideration of natural disasters reduces the capacity of the environment and its self-regulation capability, which is reflected in ever greater damage due to natural disasters and in social instability or injustice. The consequence of an acquisitive attitude toward land is greater instability of natural processes that subsequently produce effects in other areas or in other forms (Natek, 2008, 158–159).

3 PROBLEMS IN CHANGING EXISTING PRACTICES IN SPATIAL PLANNING

Municipalities of Luče and Nazarje

In the case of Luče and Nazarje, Privšek (2007) investigated to what extent the terrible consequences of the flood of November 1, 1990, influenced changes to the spatial planning documents of the two municipalities. The flooding mostly affected the new parts of settlements that spread onto the flood areas after 1970 (Boltinov travnik and Log near Luče and Prihova and the Glin factory area in Nazarje along the Savinja River, and Dobletina and the lower part of Nazarje along the Dreta River).

The situation around Luče has not changed significantly since 1990. Four houses and a small factory have been built near the Lučnica and Savinja rivers, and the bad flood experience has only been partly considered in the municipality's spatial planning for Luče since although new residential construction is anticipated within the existing settlement, replacement construction has been allowed on farmland on the right bank of the Lučnica River. They intend to provide greater flood safety for the lower parts of Luče by constructing a bypass on the Radmirje-Lučé regional road and deepening the bed of the Savinja River. This will cause greater pressure on the areas along the Savinja River just above Luče and along the Lučnica River, which in the current spatial plan are defined as mixed use areas (Privšek, 2007, 54).

In Nazarje, the flood protection issue is even more contentious. During the flood in November of 1990, extensive areas were affected but small factories and larger industrial plants were subsequently built on both sides of the Savinja River, and a gymnasium, a store, and a restaurant along the Dreta River. The municipality's spatial plan anticipates the continued development of the small manufacturing and industrial areas, which should be protected by the existing dike. To the south, areas of mixed use are expanding onto farmland on the left bank of the Dreta River that are protected by a low dike; however, flood waters poured over this dike during a smaller flood in 1998.

The spatial development of Nazarje could be reoriented from the threatened flood plains to a higher unthreatened forest area east of Nazarje and above Dobletina a kilometre away, which would certainly reduce the threat to the settlement.

Celje and Laško

Flooding in Celje is a geographical inevitability, the consequence of locating a large city at the confluence of the Voglajna, Ložnica, Hudinja, and Savinja rivers. Major floods occurred here in 1550, 1772, 1813, and 1850 (Trontelj, 1997, 109). In the 20th century alone, Celje experienced devastating floods in 1901, 1923, 1925, 1926, 1933, 1954, and 1990 (Aristovnik, 2005).

Before the efforts to manage floods by regulating the Savinja between 1876 and 1893, there were almost forty square kilometres of flood areas in the Savinja Valley that were sparsely settled and functioned as a large retarding basin for flood water. The regulation works reduced the extent of this “natural reservoir” to a few square kilometers, and the construction of dikes on both sides of the Savinja right along the riverbed sealed the fate of Celje, which now has almost no possibility of defending itself from flooding (Natek, 1992, 172).

Because of its location on the floor of a narrow valley, Laško has frequent problems with flooding. The Savinja River, for example, achieved a discharge rate of 1,406 m³/s on November 1, 1990, and rose by six meters (the average discharge between 1961 and 1990 was 41.5 m³/s). Although the natural conditions in Laško make larger preventive measures impossible, the government allowed by decree the expansion of the health spa on riparian flood land. The consequences were predictable: during the floods in September 2007, the new buildings suffered 1.8 million euros worth of damage. The government has promised to provide financial help, although its decision was in complete contradiction to the standards of sustainable development and the applicable legislation (Mekina, 2007).

Škofja Loka region

Lives were lost and great material damage caused unnecessarily during the flooding of the Selška Sora River in September 2007 since ominous precedents were readily available. Previously, the river swept away a bridge in Železniki and five kilometres of road in the Davča Valley farther upriver in 1990, and it flooded again in 1992, in 1993, and in 1995 when three hundred meters of road were washed away in the Davča Valley as well as a bridge and a road in Železniki. In September 2007, the water level of the river rose two meters in half an hour in Železniki. The neighbouring Poljanska Sora River overflowed its banks in 1901 and in 1926 when it destroyed twelve bridges between Žiri and Škofja Loka as well as in 1964, 1965, and 1982 (Orožen Adamič and Kolbezen, 1984).

Similar events occurred in Kropa, which developed around ironworking workshops along the river at the bottom of a narrow ravine, and in Podbrdo, where a textile mill was once built over the Bača River.

4 SUITABLE SOLUTIONS TO “SPATIAL PRESSURE”

The idea that flood defences can guarantee complete security is common, even in professional circles, which results in numerous proposals for the construction of

retarding basins for flood waters. However, due to the great space requirements and the irregularity of flooding, this solution is not suitable for the torrential rivers in Slovenia's hilly and mountainous regions. Furthermore, retarding basins do not always provide effective protection against flooding as demonstrated by the floods in Prague and other cities along the Vltava River in August 2003, the many times smaller floods along the Drava River below Maribor and the flooding of the northern part of Celje on September 18, 2007 in spite of the Šmartinsko jezero reservoir on the Koprivnica stream.

Figure 3. A flood affected new dwellings in Nomenj on September 18, 2007 (photograph: Aleš Smrekar).



Such “ultimate” solutions to the problem of flooding not only require (too) large interventions in the functioning of natural processes but also create a subjective feeling of complete security from future flooding that encourages the spread of urbanization onto flood-threatened areas. They also conflict with the provisions of the 2007 directive of the European Parliament and the Council of Europe on the assessment and control of flood risk valid since November 26, 2007, that requires of European Union members that they “must in planning, to the extent possible, consider the conservation and/or renewal of flood areas” (Preamble, point 14).

The basic problem in areas such as those described above is not floods as a natural phenomenon per se but rather their influence on human activity. Valley floors are actually enlarged channels for excessive flood water. We have exploited these narrow and valuable valley bottom areas by constructing buildings and roads and in a way ignoring natural conditions. The number of buildings of public importance such as factories and hospitals as well as infrastructure in flood areas has grown, and the flood risk in threatened and vulnerable settlements has increased due to their growing number of buildings and the rising value of real estate.

Regardless of the diverse views on the use of flood areas, natural processes and human activity are always tightly interwoven. Man has more or less successfully adapted himself to natural limitations, and also greatly altered the natural conditions. The thought therefore prevails that the land belongs only to humans but, regarding their natural functions we should consider flood areas as special. In this way we will acknowledge the role of natural processes in the landscape, curtail the ambitions of spatial planners, and reduce the burden on water management authorities.

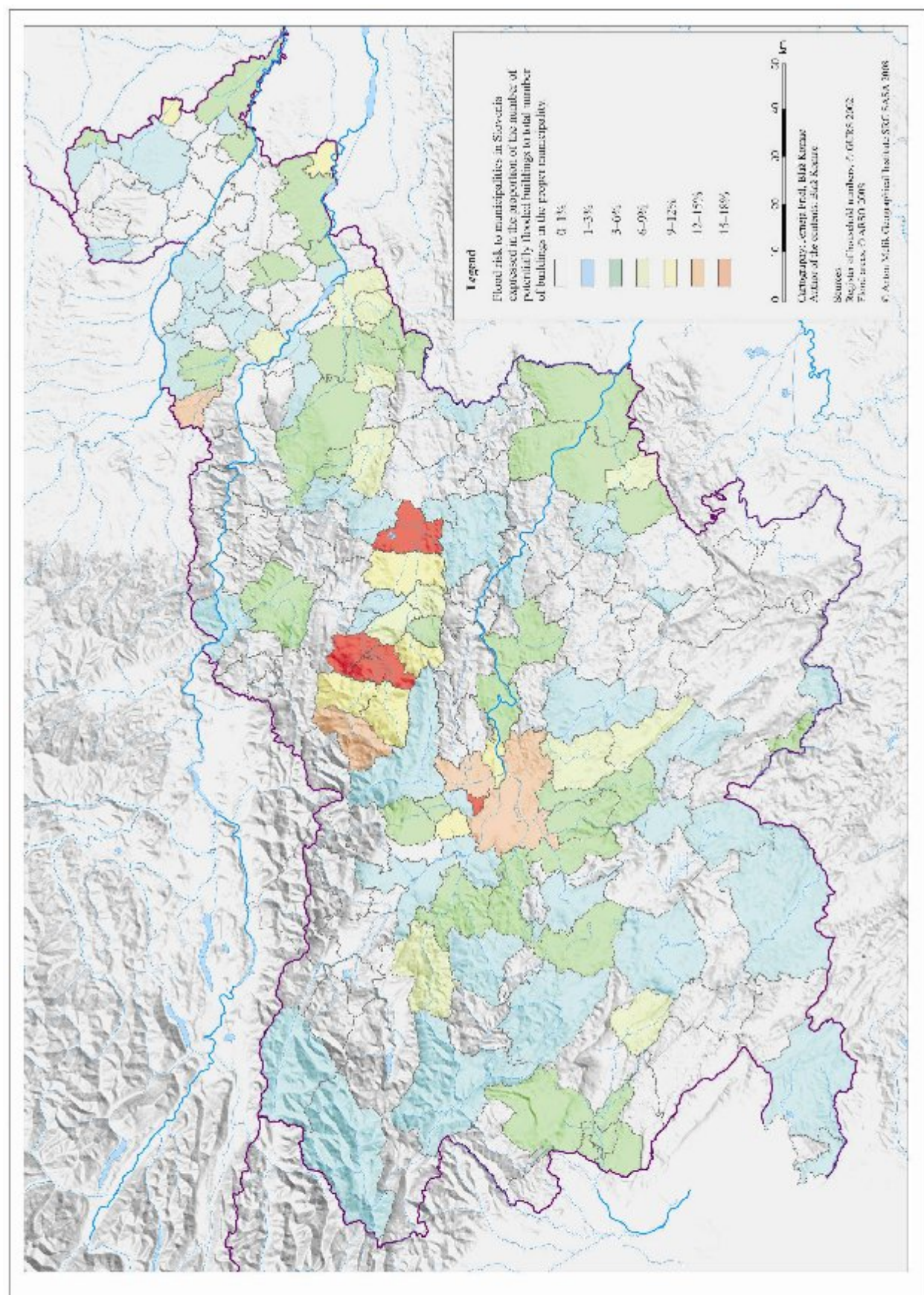
5 CONCLUSION

Slovenia has almost three thousand square kilometres of flood areas, almost 15% of its national territory. The majority of these flood areas (2,370 km²) occur in narrow, torrential valleys (Orožen Adamič, 1998, 318; Fridl et al., 2007). Almost ten square kilometers of built-up land and more than 3% of all buildings in Slovenia are located in flood areas.

Figure 4 shows the flood risk to Slovenia's municipalities relative to the number of buildings on flood areas in each municipality and the number of all buildings in each municipality expressed as a percentage. The data on flood areas is inaccurate in some cases (Enotna..., 2002; Zemljevid..., 2008), as evident in the case of the municipality of Bohinj, for example, which is shown as unthreatened but suffered major flooding on September 18, 2007. Municipalities in the Savinja Valley (Celje, Nazarje) are most at risk, the municipality of Trzin stands out as well, and the municipalities of Luče, Prevalje, Domžale, and Ljubljana are greatly threatened. If the number of residents of individual municipalities is considered, the municipalities most at risk are Ljubljana, Celje, Domžale, Žalec, Brežice, Mozirje, Grosuplje, Slovenske Konjice, Nova Gorica, and Kranj.

The greatest defect in the management of space in these areas is the lack of consideration of natural factors. We therefore spend much greater sums on cleanup and rehabilitation than on preventive measures (Zorn and Komac, 2006). Among the most important reasons for this situation are the lack of adaptation to natural conditions and forgetfulness (Komac and Zorn, 2007). Furthermore, it is senseless to lay the blame on climate change; torrential flooding in Slovenia is a completely normal natural process but, society must constantly adapt itself to the changing environment.

Figure 4. Flood risk to municipalities in Slovenia.



In dealing with natural threats, we must change our thinking and shift from trusting defensive measures to controlling risk and live with the fact that floods are inevitable (Najboljše..., 2003, 6). Seeing nature as an obstacle to progress that can be overcome using modern technology rather than as a constantly changing complex of processes is prevalent misconception. Because we think that we can control nature, we wrongly believe we can solve the flood problem just by building dikes. Instead of trying to understand the nature, features, effects, and extent of natural processes and adapt to them, we try at all costs to satisfy our immediate desires. These involve primarily the desire for profit, which is reflected in building infrastructure and industrial objects in flood areas, and the desire for comfort, which is reflected in the wish to live in beautiful but dangerous areas such as along river banks.

Planning the use of space must consider natural limitations and employ different standards for different needs (e.g. the construction of expressways or settlements). The basic paradigm for dealing with these problematic areas should be sustainability, working responsibly with a long-term orientation. It is not good enough merely to take measures after natural disasters but we must above all think preventatively. This would lead to respecting natural processes and the applicable legislation. If the laws had been respected, a study of the 1954 and 1990 floods would not say "*that certain buildings (hospital) were equally affected in both disasters*" (Jesenovec, 1995, 34) or another study after the floods in 1990 that "*the most affected were those residential and business buildings erected on ill-considered sites. Most of them were built in modern times*" (Horvat, 1995, 53).

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