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FLOODPLAIN IDENTIFICATION IN THE CONTEXT OF FLOOD EXPOSURE OF MARGINALIZED ROMA COMMUNITIES

Marián Jančovič*, Anna Kidová*

* Institute of Geography, Slovak Academy of Sciences, Štefánikova 49, 814 73 Bratislava, Slovakia, geogjanc2@savba.sk, geogkido@savba.sk

Floodplain identification in the context of flood exposure of marginalized Roma communities

The article deals with the spatial identification of river floodplains in order to locate marginalized Roma communities exposed to fluvial floods. It works mainly with data from the Atlas of Roma Communities published in 2019, which for a sample of 231 out of a total of 696 segregated communities is supplemented by a more accurate spatial representation within the respective municipality. The main methodological tool was the height above the nearest drainage parameter, which was derived from DMR3.5 data and, at the local level in the locality surrounding the settlement of Pribylina (Northern Slovakia), from the more accurate DMR5.0. We have shown that most of the mapped communities lie less than 100 m in proximity to the watercourse, even more than a half of them are located closer than 30 m. On a floodplain within 4 m high from adjacent watercourse we identified 114 marginalized Roma communities. The distribution of the marginalized Roma communities present on the floodplain corresponds to the overall distribution of Roma communities in Slovakia, but the highest number of such communities situated on the floodplain is in the Prešov region.

Key words: floodplain, marginalized Roma communities, segregation, height above nearest drainage, flood exposure, Slovakia

INTRODUCTION

Climate change has become one of the most acute problems human society has faced in recent decades. Among its manifestations is the increasing intensity and frequency of extreme hydrological events such as floods on a global scale (Cook et al. 2018 and Tabari 2020), which pose a direct threat to affected communities. However, their impact is not evenly distributed across society. For example, floods appear to be a greater risk for poor and marginalized populations (Walker and Burningham 2011 and Linscott et al. 2022). On the one hand, the source of increased flood risk may be materially determined by a reduced ability to cope with floods. In the literature, this corresponds to the concept of flood vulnerability (Wright 2015). The other side of flood risk is flood hazard. It expresses the susceptibility of a given place to flooding. Due to sociospatial segregation, discriminated populations may be pushed into otherwise uninhabited and unsafe environments thereby increasing their exposure (Qiang 2019 and Chakraborty et al. 2022).

In the context of Central Europe, the marginalized Roma communities (MRCs) are a prime example of social exclusion and segregation (Rochovská and Rusnáková 2018). According to qualified estimates from the 2019 Atlas of Roma Communities – ARC (Ravasz et al. 2019), the Roma population makes up almost 8% of the total population of the Slovakia, making them the 2nd largest ethnic minority. However, according to data from the 2021 Population and Housing Census, they make up just under 3%. Within Slovakia, Roma are unevenly distributed, with the largest numbers living in the east and south and the smallest numbers in the northwest and west of the country (Matlovičová et al. 2012). According to the 2019 ARC, approximately 30% of the Roma population live dispersed among the majority and the remaining 70% in ethnically homogeneous concentrations (Ravasz et al. 2019). The possibility of increased risk in their case is also indicated by the fact that the most tragic flood event in our country hit the Roma settlement in Jarovnice in 1998. This resulted in dozens of casualties and hundreds of people losing their homes. In SITA and TASR agency reports from 1996 – 2010, the threat or inundation of Roma settlements was directly mentioned in connection with floods in as many as 31 distinct cases (Solín 2023). However, MRCs have so far been studied mainly in terms of their vulnerability (Filčák 2012), but the physical and geographic aspect of their exposure to natural hazards has not been emphasized.

The most comprehensive source of data on Roma communities in the Slovakia is the ARC. It has been published since 2004 and its 3rd and most up-to-date version is from 2019. It contains a wide range of attributes describing over 1,100 concentrations of the Roma population obtained mainly by the questionnaire method from representatives of municipalities in which the presence of the Roma population has been identified (Mušinka et al. 2014). The entire dataset is presented in tabular form, and the most accurate spatial information regarding individual communities relates only to its municipality. It classifies each concentration by type based on its location relative to the adjacent village. It thus establishes the categories 'Inside the village' (406 communities), 'On the outskirts of the village' (502 communities) and 'Outside the village' (194 communities). It also includes a binary attribute directly indicating whether the concentration is being flooded. Among a number of other dataset, we distinguished the data dedicated to the availability of water in the dwelling concentration of the Roma population.

According to the ARC, communities located 'inside the village' are generally less socially excluded and distinguishable from the rest of the population (Ravasz et al. 2019). For this reason, we exclude them from our analysis and work only with concentrations of the type, 'On the outskirts of the village' and 'Outside the village', which we will refer to as segregated MRCs. As the distance from the village centre increases, the proportion of unresolved land property rights with do it yourself forms of housing increases in Roma communities. These can also be situated in unsafe and otherwise uninhabitable locations. According to the ARC, 30% of such communities are flooded and 24% of such communities are completely without an available public water supply connection. This prompts an examination of the environment in which MRCs are located in terms of flood hazard.

Approaches to flood hazard research are numerous (Teng et al. 2017). They vary in their data and computational complexity. They range from very reliable hydrodynamic models (Candela and Aronica 2017), such as the Slovak Hydrometeorological Institute (SHMÚ) has for selected river sections, to highly simplified approaches designed for national to continental level applications with more limited data. The latter includes, for example, the height above the nearest drainage (HAND) parameter (Rennó et al. 2008). In addition, the inundation area can also be indicated, for example, by floodplains of rivers (Ghosh and Kar 2018). Fluvial floods are also linked to active floodplain areas, which caused approximately half of the flooding events in Slovakia between 1996 - 2006 (Solín 2007). The spatial identification of floodplain areas may thus represent one of the ways to express the hazard posed by such floods.

The paper aimed to build on the ARC at the national level to deepen the understanding of the relationship between segregated Roma communities and flood-prone river landscapes. Based on the ARC, aerial imager, ZB GIS buildings layer and Google Street View, we were concerned with identifying those MRCs that are located on the floodplain and therefore assumed to be exposed to fluvial flooding. The application of such analysis on the national level restrained us from using simplified methods such as HAND. The primary goal of this paper was thus the identification of MRCs located on the floodplain and our secondary goal was to deal with the parameterization of HAND when used at the national level.

MATERIAL AND METHODS

The total number of segregated MRCs recorded in the ARC is 696. Since the original data are not localized within the municipality, our first step in analysing their exposure to flooding was to obtain more detailed spatial information. To do this, we relied on ARC data that included the name of the street or other geographical location in the name attribute of each marginalised community. Other useful information about MRCs was the number and type of houses that form them or, potentially, the type of barrier that separates it from the village or the distance from the village.

We used this information to spatially identify segregated MRCs based on aerial imagery. Google Street View was also helpful in cases of uncertainty. We also identified a significant portion of segregated MRCs through the ZB GIS building layer. The 'TXT' annotation attribute identified the buildings as Roma dwellings in some cases. We selected such buildings, aggregated their clusters into convex hulls and, if they were located in municipalities with segregated MRCs, we evaluated whether they mark respective communities based on ARC data. We thus obtained a spatial database of 561 (out of 696) segregated concentrations of the Roma population (Fig. 1). They were recorded into a polygon layer where each feature represents one segregated MRC. We have not been able to identify mostly small communities indistinguishable from the rest of the village.

One of the simple metrics of proximity can be Euclidean distance. We computed it between each mapped MRC from the edge of the polygon to the nearest ZB GIS watercourse point. Although this does not in itself indicate a flood hazard or the presence of a floodplain, it does indicate a general trend in the relationship of settlements to watercourses.

The raster HAND layer was obtained using the method described by its authors (Rennó et al. 2008). We used the QGIS software with the PCRaster extension (Karssenberg et al. 2010) for this purpose. From the digital elevation model (DEM), we first derived the flow direction, from which we subsequently obtained a raster of the flow accumulation (O'Callaghan and Mark 1984). By setting a minimum contribution area threshold, we obtained a newly produced streamflow layer. The combination of flow direction and the streams network allowed us to determine the actual subcatchments for each stream pixel. The HAND itself was then obtained by subtracting the lowest elevation of each subcatchment from the original DEM values. The HAND threshold for floodplains identification was based on its distribution function calculated over all of the pixels of any mapped MRC. Since the floodplain is predominantly flat and in close proximity to watercourses (Goudie 2004), the lowest HAND values can be expected there. In this context, we therefore identified such segregated MRCs that reached HAND values less than the 1st quartile over most of their area. For a right-skewed distribution, the arithmetic mean corresponds to the most of the area. Plains have similar properties of relief. However, these are not as associated with floods as floodplains and therefore we had to distinguish between them. To do this, we used a layer of geomorphological units of the Slovakia (Mazúr and Lukniš 1978), from which we selected the plains.

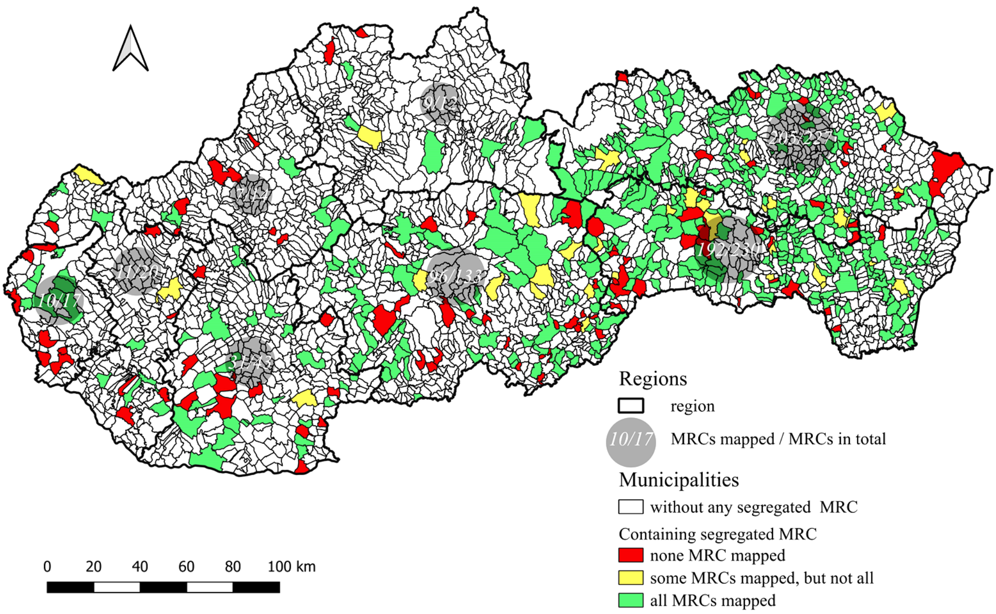

Fig. 1. Spatial representation of segregated MRCs in municipalities of Slovakia

Municipalities with at least one MRC (according to the ARC) are coloured. In green municipalities, we have spatially identified all of the MRCs. In yellow municipalities, we have mapped at least one MRC, but some stayed unidentified. In red municipalities, we could not spatially identify any MRC. Sources: ARC, ZB GIS.

The most important step in the HAND calculation was the selection of the contribution area threshold for the production of the streamflow layer. The omission of a watercourse due to a very high threshold will in fact increase the HAND value. With a low threshold, artificial, unrealistic streams are generated, which in the contrast reduce the HAND value. To determine the extent to which these errors are produced, we compared the results of the different thresholds with the ZB GIS stream layer, which in our case was a better representation of the real condition. We achieved this by using a buffer around both line layers. Since the ZB GIS streams with the estimated location have a maximum error of 20 m (Geoportal 2022a) and the DMR 3.5 from which we derived the contribution area has a spatial resolution of 10 m (Geoportal 2021), we chose a buffer width of 30 m. Subsequently, we computed the percentage of the first layer of watercourses that is in the buffer of the second layer and the same in reverse. Thus, we obtained two proportional values that informed us about the matching of the line layers used. This procedure was applied to contribution area thresholds ranging from 0.1 to 0.2 km^2. In a region as large and diverse as Slovakia, the effect of a single threshold value cannot be expected to be the same across the whole country. For this reason we have made the whole comparison on three types of geomorphological units: plain, upland and highland.

In this paper, we discuss the use of HAND specifically in conjunction with floodplain identification. Therefore, we were interested in the distribution of values of the outputs of this method mainly in the floodplain environment and its immediate surroundings. We spatially identified the floodplains based on the DMR 5.0 in the form of shaded relief. Floodplains are easily recognized that way, thus we could use it as reference layer. As a validation layer for HAND, we used the DEM normalized by the average slope of the watercourse channel in the selected segments as follows:

$NDEMi = (DEMi - DEMmin) - (s * d)$ and

$s = atan\ ((DEMmax - DEMmin) / dmax)$,

where *NDEM* denotes *DEM* normalized by the average channel slope of the watercourse, *i* represents individual raster pixels, *min* is the location of the watercourse outflow from the selected area, *max* is the location of the watercourse inflow to the selected area, *d* is the horizontal Euclidean distance from the location of the watercourse outflow from the selected area, and *s* is the constant of the average channel slope in the investigated section.

For the analysis of the distribution of HAND values on the floodplain, we worked with a 2 km long section of the Belá River near the village of Pribylina. There is a wide and well-developed floodplain with which we are familiar and a segregated MRC too. Due to our validation layer methodology using the average channel slope, we worked with maximum 2 km long sections. The longer the section is, the larger the errors in the validation layer would be due to deviations from this average slope. Analyzing the spatial distribution of HAND values on the floodplain gave us the opportunity to evaluate the influence of different spatial resolution of the input DEMs on the HAND results. For this purpose, we used DMR 3.5 with a spatial resolution of 10 m and height accuracy within 1 m in 61.21% of cases, up to 3 m in 89.66% of cases and with an accuracy of up to 5 m in 97.42% of cases (Geoportál 2021) and DMR 5.0 with a spatial resolution of 1 m and height accuracy 0.04 m (Geoportál 2022b).

RESULTS

MRC Watercourse Proximity

Up to almost three-quarters of the mapped segregated MRCs are located less than 100 m from a watercourse, and more than a half of them are located closer than 30 m from a watercourse (Fig. 2A). 220 of mapped MRCs (39 %) are situated less than 10 m from nearest ZB GIS stream. Q90 value is 278 m.

The distribution of HAND values calculated over all of the pixels covering any of the mapped MRC (Fig. 2B) was skewed right with a mean value of 17 m, Q25 = 4 m and Q75 = 22 m. Therefore, we classified each MRC with a mean HAND value below 4 m as located on a floodplain (Fig. 3). The exception was communities intersecting the plains layer, which we classified in a separate category.

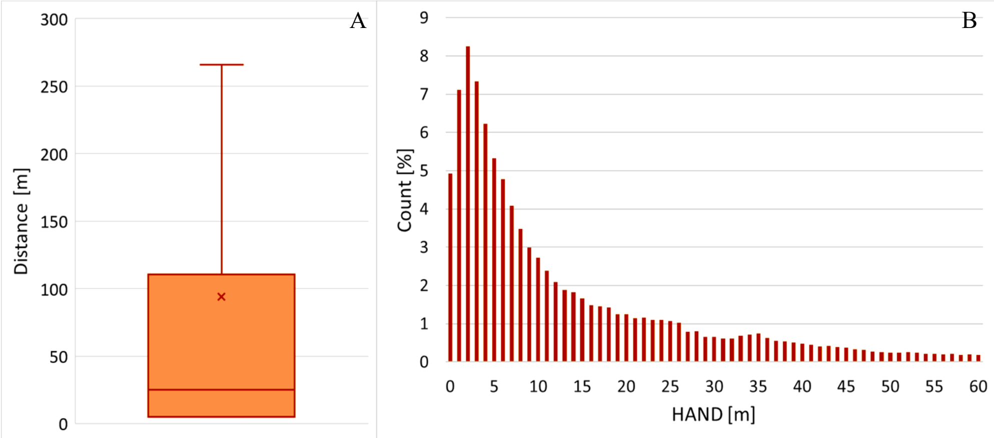

Fig. 2. A – Distance of segregated MRCs (calculated from the nearest point of the polygon) to the nearest watercourse (ZB GIS). Whiskers length is: 1.5 × (Q_{75} – Q_{25}), B – Distribution of heights above the nearest drainage (HAND) computed over all pixels covering the MRCs

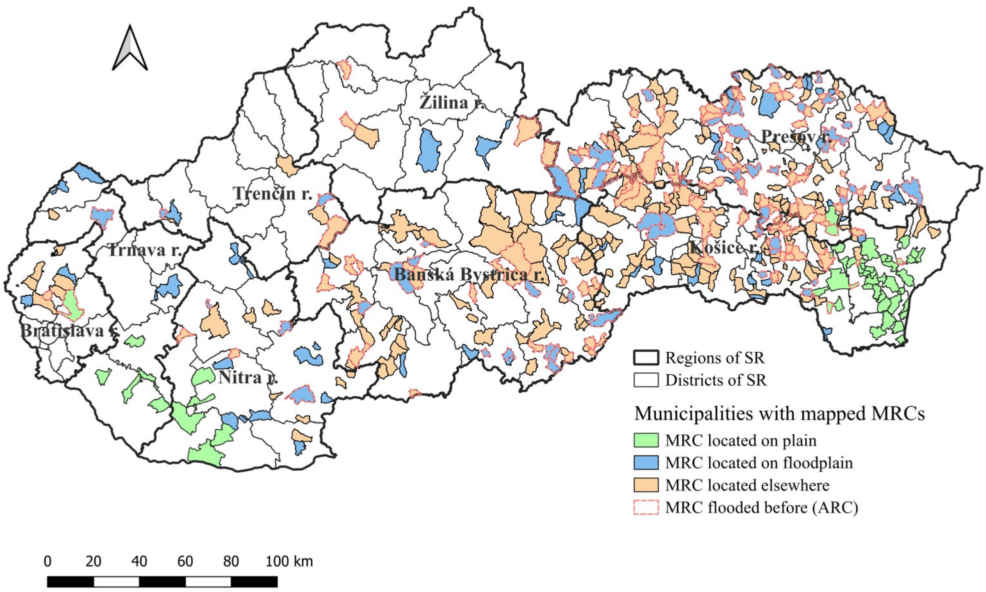

Fig. 3. Municipalities with segregated MRCs located on floodplain or plain
Sources: ARC, ZB GIS, DMR 3.5, Geomorphological units of SR.

In total, we were able to identify 114 segregated MRCs present on the floodplain. Most of them were located in the Prešov region (49), then the Košice region (23), Banská Bystrica region (21), Nitra region (10), Trnava region (4), Trenčín region (3) and both Bratislava and Žilina region (2). It corresponds to the overall distribution of Roma communities. On the district level, MRCs situated on the floodplain were situated most frequently in the districts of Košice – okolie (9), Prešov (8), Svidník (7), Poprad (6) and Bardejov (6). Less than one third (182) of the mapped MRCs were so far flooded according to the ARC (90 in Prešov region, 43 in Košice region, 33 in Banská Bystrica region, 6 in Nitra region, 4 in Žilina region, 3 in Trenčín region, 2 in Bratislava region and 1 in Trnava region). Fifty five MRCs were both situated on the floodplain and experienced flooding according to ARC. Most of them were located in Prešov region (27), then Banská Bystrica region (12), Košice region (10), Nitra region (3), Trenčín region (2) and Trnava region (1). Only 6 MRCs situated on the plain have also experienced flooding according to the ARC.

HAND Limitations

A comparison of the stream network generated by us with the ZB GIS layer (Tab. 1) revealed some common tendencies for each of the geomorphological types studied. In general, lower thresholds had a better coverage of the ZB GIS reference layer, but at the same time they also created streams where they should not have been generated more frequently. Therefore, they generally tended to overestimate. The opposite tendency could be observed for higher threshold values. However, in our case there was a significant effect of both underestimation and overestimation independent of the flow accumulation threshold. This was most pronounced in the plane area where there were a number of artificially modified small streams and canals. The layer of streams created by setting the minimum flow accumulation value tended to follow more closely the course of the original inactive channels, which does not correspond to the ZB GIS layer. Therefore, for the HAND analysis, we accepted the variant with higher thresholds (0.2 km^2), thus minimizing the proportion of inactive channels.

Tab. 1. Matching of the ZB GIS stream layer with the stream layers created according to the minimum catchment area value from DMR3.5

	Plane			Upland			Highland		
Flow accumulation threshold (km^2)	**0.10**	***0.15***	**0.20**	**0.10**	***0.15***	**0.20**	**0.10**	***0.15***	**0.20**
False positive streams ratio (%)	54.80	*59.30*	62.50	60.60	*48.70*	54.30	47.40	*55.70*	60.70
False negative streams ratio (%)	22.10	*18.60*	16.50	14.40	*12.20*	11.10	11.10	*7.60*	6.10

On a 2 km long river stretch of the Belá River in the surroundings of the village of Pribylina, we investigated the distribution of HAND values of its floodplain, which contains segregated MRC as well. In order to be able to assess the distribution of HAND values, we compared it to DEM normalized by the average slope of the channel (Fig. 4). The elevation difference DEMmax – DEMmin was 37 m, thus the average slope s = 1° 3’ 35’’. The elevation error of reference normalized DEM ranges from -1.06 to 3,44 m (Fig. 4B).

The distribution of HAND values on the Belá floodplain at the underlying DMR 3.5 and DMR 5.0 reached high values considering it is a floodplain (Fig. 4E). According to the HAND from DMR 5.0, up to a quarter of the floodplain was more than 10 m above the stream, and up to approximately half of the area was more than 5 m above the stream. The HAND calculated from DMR 3.5 was generally slightly lower, with a quarter of the area reaching values above 9 m and half above 4 m. Compared to DMR 5.0 normalised by the average slope of the channel, where 77% of the area was within 2 m above the channel and only 4% of the floodplain reached values higher than 4 m, we get radically different results, even including the aforementioned elevation error of the method of normalising the DMR by the average slope of the channel.

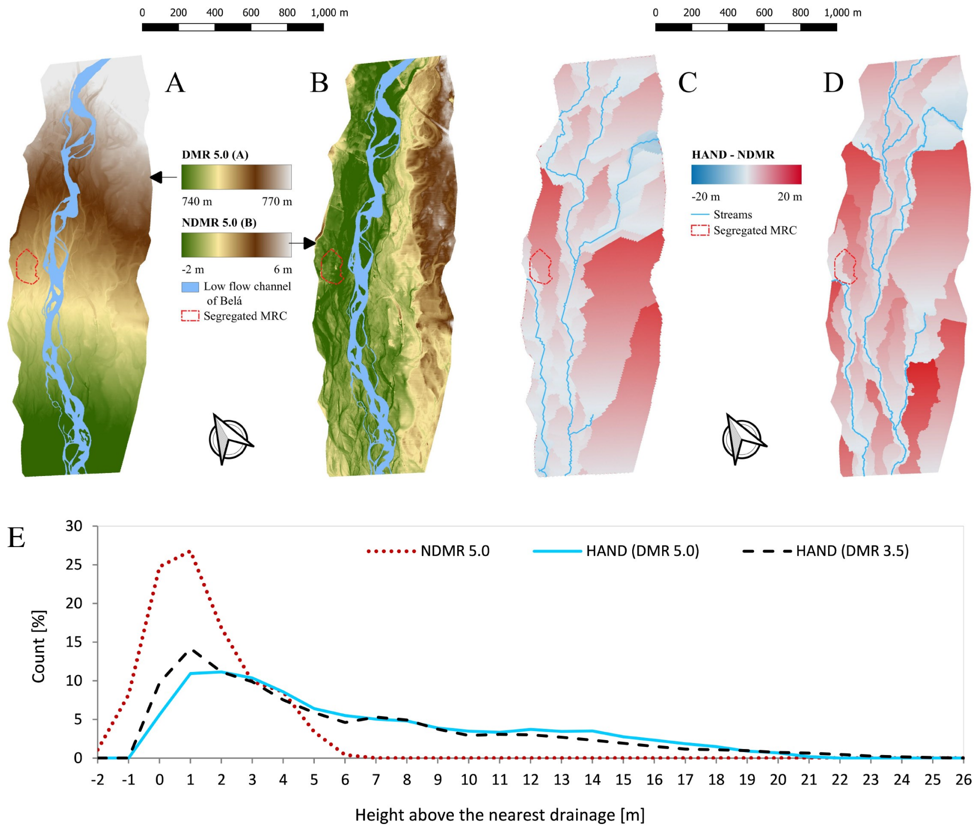

Fig. 4. The floodplain of the Belá watercourse
DMR 5.0 (A) and DMR 5.0 normalized by average channel slope (B); spatial distribution of HAND values calculated from DMR 3.5; DMR 5.0 (D) and graphical distribution of normalized DMR values (E)

DISCUSSION

In this paper, we have addressed the identification of segregated MRCs located at the floodplain. This is because a location in these areas can indicate a flood hazard (Ghosh and Kar 2018), as fluvial floods are associated with active floodplains. However, how to distinguish active floodplains from those that no longer inundate due to geomorphological development or water management? Typically, the 100-year flood extent is used (Goudie 2004), but modelling this at a national scale would require a huge amount of hydrological or topographical data. In the HAND method we use, which has also found applications in spatial identification of floodplains and flood hazard assessment (Nobre et al. 2015 and Clubb et al. 2017), although it does increase the height above the nearest watercourse in the areas behind the levees due to increased distance in the flow direction, it fails to incorporate water management tools, such as dams, that affect the hydrological parameters of the watercourse. Hence, we were thus unable to recognize the active parts of floodplains.

This is one of the reasons why the segregated MRCs that are located on the floodplain have largely not been included among those that have been previously inundated according to the ARC. Another reason may be based on the ARC methodology (Ravasz et al. 2019), which considers only the empirical occurrence of flooding in MRCs. However, it does not make it clear in what timeframe they should have been flooded, nor does it highlight those that have not yet managed to experience the hazard. Conversely, in some cases, the ARC also identifies flooding in MRCs that are not located on the floodplain according to our results. One reason for this may again be a methodological disparity, as the ARC does not distinguish between flood types and presumably includes non-fluvial floods, which may not be bound to the floodplain area.

Another source of discrepancy was the systematic increase of HAND values on floodplains with a higher slope along the flow direction than in the cross-sectional direction, which could be seen in the example of the Belá floodplain. The spatial distribution of HAND values (Figs. 4C and 4D) revealed the cause of its higher values even though it was a floodplain area. This was due to the way in which the distance to the nearest drainage is defined, associated with the nature of the Belá floodplain. The latter is a braided-wandering river with a number of inactive side channels. The flow direction, according to which the distance to the nearest drainage was calculated, followed these channels often flowing parallel to the active low-flow channels. The defined distance was then higher because it was calculated up to the confluence of the side channel with the main low flow channel. By having the flow direction always pointing to the lowest neighbouring pixel we can also conclude that the distance to the nearest drainage and the resulting HAND value are directly proportional to each other. An increase in this distance therefore implies an increase in the resulting HAND value. In the environment of the Belá floodplain, this caused an increase of up to 20 m in elevation, while the same locations may not be more than 1 m above the level of the channel, regardless of whether DMR 3.5 or DMR 5.0 was used. This was the case of the segregated MRC located on the Belá floodplain, where HAND values (computed from both DEMs) for more than half of its territory were higher than 5 meters, even though the reference normalized DEM peaked at 2 meters above the Belá low flow channel.

The discrepancy in our results compared to the ARC could be related to the representation of the watercourses that we used to calculate HAND too. Although the representation differed most significantly from the ZB GIS streams in the area of plains (Fig. 5A), where segregated MRCs were classified to a separate category, we also omitted more than 40% of the mostly small streams in the other geomorphological units from the calculation (Tab. 1 and Fig. 5B). Irrespective of the geomorphological units, it was not possible to set a threshold that would include most of the streams in the ZB GIS and at the same time minimise the number of streams that were not recorded there. In addition, with a single threshold set high enough, we could get rid of most of the redundant streams, even if it meant filtering out a significant number of the real ones as well. As a consequence, HAND values were higher there, which may have led to false negative identification of MRCs on the floodplain. Opposite examples of MRC false positives on the floodplain may also have occurred, but the proportion of false positive streams was several times lower.

Fig. 5. Comparison of the spatial representation of streams derived from DMR3.5 (black dashes) and ZB GIS (white) on the example of the Východoslovenská nížina plain (A); example of a missing river section of a DMR3.5 derived stream flowing through MRC (B)

If a stream layer derived from a minimum threshold of flow accumulation was used to compute HAND (Donchyts et al. 2016), the layer obtained does not correspond (especially on the plains) to the real flow pattern of the watercourses. However, the use of an existing streams layer (Johnson et al. 2019), if not generated from the same DEM as HAND, similarly produces an error. Specifically, in locations where the course of the stream vector does not correspond to its channel in the DEM. A hybrid solution is also an option, which consists in reducing the DEM values by a fixed constant at locations crossed by such a layer of streams (Luo et al. 2011). While this partially solves the problem of incompatibility between the DEM and the watercourse layer, it also systematically increases the HAND values by a set constant.

We also showed that a high proportion of segregated MRCs are located in close proximity to a watercourse measured both in Euclidean distance and height above the nearest drainage. This proximity is necessary for the occurrence of fluvial floods and demonstrate the importance of the physical geographic aspect of flood exposure. The same could probably be said for the remaining population's settlements in Slovakia. However, most of the major flood protection in the territory of present-day Slovakia was built during the socialist period (Bednárová et al. 2010), which corresponds to the population explosion and the growth of settlements throughout the country (Šprocha and Majo 2016). On the contrary, the rapid increase in the number of Roma living in segregation, and hence in segregated settlements, has occurred mainly since the period of transformation in the 1990s (Matlovičová et al. 2012 and Ravasz et al. 2019). In the post-socialist era, however, state activity in creating flood protection infrastructure has also been significantly weaker (Bednárová et al. 2010). Thus, it is clear that segregated Roma settlements are not as protected as towns or cities, and occupied uninhabited and unsafe environments which would relatively increase their exposure to flooding, similar to stated in works by Qiang (2019) and Chakraborty et al. (2022). However, such a comparison of the presence of flood protection measures or flood exposure for MRCs and villages would be very difficult at the national level. Inspiration for research at the regional scale can be drawn from the work of Filčák (2012), in which the author analyses inequalities between MRCs and towns using a sample of 30 MRCs. Though there is a part de-dicated to floods in his book, it doesn't elaborate the relation between topography and floods, which, as we have shown, is crucial for this kind of research.

CONCLUSION

This work was aimed at identifying segregated MRCs that are located on the floodplain and thus exposed to flooding. The first challenge was spatial identification of those communities within their municipalities. We managed to do so using ARC, aerial imagery, ZB GIS buildings layer and Google Street View, resulting in identification of 561 out of 696 segregated MRCs. We were unable to locate mostly small communities that were indistinguishable from their surroundings.

For floodplain identification, we chose a methodology that is characterized by its low data requirements and thus we were able to apply it to the entire territory of Slovakia. Although, working with the HAND method opened several questions related mostly to its parametrization, we have identified 114 segregated MRCs located on the floodplain. Up to almost three-quarters of segregated MRCs are located less than 100 m from a watercourse, and more than a half of them are closer than 30 m from a watercourse. In only 55 cases were Roma communities both on a floodplain and flooded compared to the ARC (although up to 182 of all 561 MRCs were flooded according to the ARC). This discrepancy results from the use of different methodologies, as well as from shortcomings associated with the HAND method. It cannot effectively distinguish the active part of the floodplain, the results are dependent on the representativeness of the watercourse network, but also have systematically higher values at locations of higher slope in the direction along the channel. The use of DEMs with better spatial resolution and lower elevation error did not affect this.

However, our research was focused on identification of floodplain, not floods. Our results therefore could not mark MRCs endangered by flood events. They indicate a potential for fluvial floods, which could be mitigated e. g., by flood protection infrastructure. Nonetheless, the results demonstrate the connection between segregated MRCs and watercourses, prompting us to further investigate this relationship at a regional scale that will allow the use of more sophisticated methods encompassing this infrastructure too. Identification of MRCs situated on a floodplain could help us narrow the dataset for future work.

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Marián Jančovič, Anna Kidová

IDENTIFIKÁCIA RIEČNEJ NIVY V KONTEXTE POVODNÍ, KTORÝM SÚ VYSTAVENÉ MARGINALIZOVANÉ RÓMSKE KOMUNITY

Cieľom článku bola priestorová identifikácia riečnych nív v kontexte fluviálnych povodní ohrozujúcich marginalizované rómske komunity na Slovensku. Pracovali sme s dátami Atlasu rómskych komunít z roku 2019, ktoré sme pri vzorke 561 z celkovo 696 segregovaných komunít doplnili o presnejšiu priestorovú reprezentáciu v rámci katastrálneho územia ich priľahlej obce. Hlavným metodickým nástrojom bol parameter výšky nad najbližším vodným tokom, ktorý sme odvodili z digitálneho modelu reliéfu DMR3.5 a na lokálnej

úrovni v okolí obce Pribylina aj z presnejšieho DMR5.0 získaného z leteckého laserového skenovania. V práci sme podrobne popísali aj nedostatky použitej metódy spojené hlavne s jej parametrizáciou a definíciou vzdialenosti od vodného toku, ktoré boli prítomné bez ohľadu na detailnosť zdrojovej vrstvy. Výsledky štúdie ukázali, že až takmer tri štvrtiny zmapovaných segregovaných marginalizovaných rómskych komunít sa nachádzajú menej ako 100 m od vodného toku a viac ako polovica z nich sa nachádza bližšie ako 30 m od vodného toku. Identifikovali sme aj 14 komunít, ktoré sú situované na riečnej nive. Atlas rómskych komunít uvádza, že iba 55 z nich bolo zaplavených, pretože naša metodika nedokáže efektívne rozlíšiť aktívnu časť riečnej nivy a údaje zo spomínaného atlasu neudávajú časový horizont, v ktorom mali byť rómske komunity zaplavené, ani potenciálne povodne, ktoré sa v tomto časovom úseku nestihli uskutočniť.

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