The geology in the wider Húsavík area can roughly be classified into Miocene basalts, Quaternary effusive rocks, Tillite (Pleistocene), and late Pleistocene and Holocene sediments (cf. Figure 1; Saemundsson and Karson, 2006). The oldest present rock is an 8.5 to 10 Ma old basalt. The 1500 m thick formation can solely be found north of the Húsavík Flatey Fault where it abruptly ceases. It is cut by numerous dikes and the individual blocks are heavily jointed and faulted, which is attributed to the tectonic processes on the HFF. Younger Quaternary effusive rocks constitute the lowest strata in the city of Húsavík. The youngest of these rocks originate from a series of effusive eruptions by the nearby Grjóthálssvöld volcano about 200 000 years BP. At higher elevations, the Grjóthálssvöld lava is present as lava rock, whereas at lower elevations, Hyaloclastite supersedes the lava rock, indicating that the lava flowed into the sea. (Saemundsson 1974; Saemundsson and Karson 2006)

The town’s area itself is underlain by several Pleistocene and Holocene sedimentary rocks and sediment layers, which generally cover the Grjóthálssvöld unit. These units originate from a complex interaction between glaciers, glacial rivers, lakes and lagoons, and a fluctuating sea level. The oldest of these units consists of glacial deposits from the early Weichsel glaciation. These layers have altered to solid Tillite rock. It is well exposed in the cliffs in the northern part of town (named Húsavíkurbakki), but probably underlays most parts of Húsavík (Eiríksson 1985; Pétursson 1988; Saemundsson and Karson 2006). In the north-eastern, central and southern part of town (here named Húsavík basin and Haukamýri) younger, late Pleistocene and early Holocene horizontally layered sediments constitute the upper most strata. They are thought to be at least 25 meters thick. However, the exact spatial extent and thickness remain mostly unknown. The layers themselves are alternating fluvial, fluvio-glacial and purely glacial deposits. All sediment layers show very different degrees of hardness: from loose and easily breakable to almost solid rock and all gradations in between. (Pétursson 1988; Halldórsson 2006) In the southeastern part of town (known as Hóll), several kames characterize the topography (Waltl 2013). Their structure is fairly complex. Fluvio-glacial deposits alternate with glacial deposits, often in a chaotic, unstructured and rearranged way (Saemundsson and Karson 2006).
The geomorphic environment of Húsavík can be characterized as littoral, hilly, and montane. The landscape genesis affiliates to tectonic, and pro- and postglacial conditions and processes. Also anthropogenic structures and activities impact the landscape’s shape. Due to similarities prevailing in the topography and landform, nine different geomorphic units can be identified (cf. Figure 2). The respective units generally have relatively small spatial extents, and therefore, a comparatively low relief energy. Nonetheless, several steep, even vertical inclinations can be found on which partly severe geomorphic processes take place. Namely, these are all kind of gravitational mass movements or landslides: coastal cliff collapses and topples, rotational and translational slides, rock and debris slides, flows, and falls, but also rock avalanches. Apart from the steep inclinations, these are provoked by the exposure to the subarctic-oceanic climate, the often lose and easily erodible surface materials with only thin or completely absent soil and vegetation covers, partly high water saturations at the surfaces and the tectonic potential in the area. (Waltl 2013)

Geomorphic hot spots can be outlined at the relatively longest and steep slopes of Húsavíkurfjall and the easterly adjoining fault scarp at the north shore of Lake Botnsvatn (rock and debris slides, falls, flows, and avalanches). The coastal line with its vertical cliffs and partly steeply inclined slopes constitutes another geomorphic hot spot. Cliff collapses and topples are common littoral processes that can be observed along the cliffs of Húsavíkurhöfði. The geological conditions in Haukamýri foster partly deep sited landslides with a high temporal frequency. These processes possibly have the biggest impact on anthropogenic structures. (Waltl 2013)

Currently, no quantitative statements on landslides and landslide potentials can be made due to a lack of detailed (hydro-) geological information, especially in the youngest geological units. The creation of a geological terrain model of these areas could close this knowledge gap. A comparatively easy and yet, efficient way with promising results constitutes a combination of core sounding/drilling (detailed 1D information), applied geophysics (especially electric resistivity tomography, seismic refraction tomography and ground penetrating Radar for 2D-information), and GIS applications (for modeling the 2D-information into the third dimension).
With regards to earthquake hazard and seismic risk, Húsavík’s building stock can be described according to three factors: the building age, material, and usage. Building age is classified by which building code was in force during construction. Four classes can be differentiated according to the different building codes implemented over time: pre-industrialization (<1945, no building codes), first building codes (1946-1975, not earthquake related), IST-13 norm (1976-2001, first earthquake related building codes), and Eurocode 8 norm (≥2002). Almost two thirds (11+49%) of the buildings were erected prior to the introduction of earthquake building codes. Various building materials are in use, with concrete leading the way (63%), followed by timber (11%) and cinderblocks or bricks (7%). The present buildings have various functions. The vast majority serves residential purposes (65%). Garages and other storage facilities represent the second most common type of building (20%). Since Húsavík is the political and functional center of the Norðurþing municipality, the town also hosts many public, retail, office, infrastructural (9%), and industrial (5%) buildings. There are recognizable patterns regarding age and usage of the buildings, but not material. By tendency, the oldest houses are built on lateglacial horizontal sediments. With some exceptions, the buildings are from younger building periods with increasing distances from the oldest core zone. Usage-specific patterns accord with the spatial planning zones of Húsavík. With some variation in the respective sections, basically all building materials were used in all building periods and all functions (Waltl 2013).

References


