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Living with Diversity In Latvia

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Living with Diversity in Latvia
People, Nature and Cultural Landscapes

Ādolfs Krauklis

A borderland in Europe's central region

Latvia is a small European country covering only 64,500 square kilometers and numbering 2,400,000 inhabitants. For all that, it is a very diverse country, and its diversity is primarily caused by its geographical position.

Located on the eastern shore of the Baltic Sea, with accessibility by sea routes from the world's oceans, Latvia lies at the same time in the central region of Europe: the distance from Latvia to borders of the continent is in no direction less than 800 kilometers (Figure 1). For that reason Latvia's territory is of great importance in the geopolitical, strategic and economic patterns of Europe [Rutkis (ed.) 1967]. So far Latvia has usually been mentioned mostly in the context of the border between Western and East-European cultural realms, as well as in the context of the "iron curtain", which divided Europe into the Communist world and the free world during the cold war period.

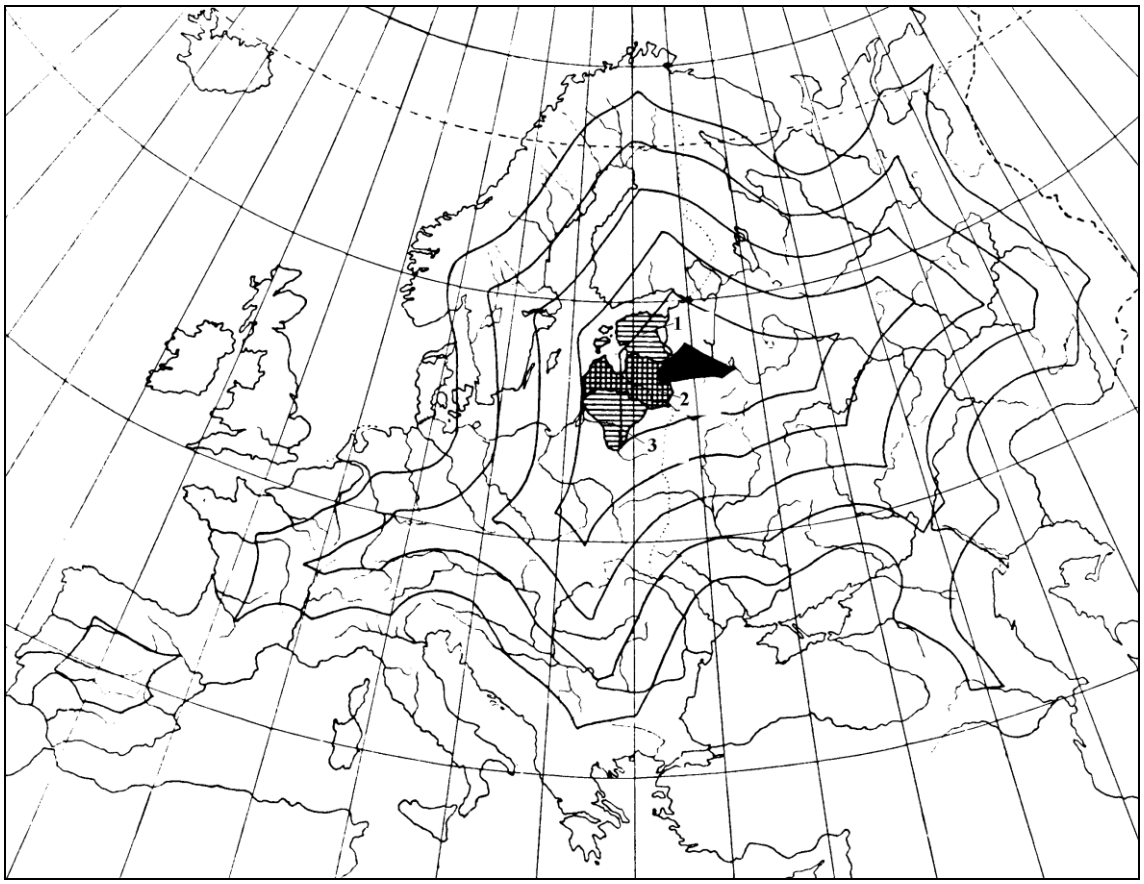

Figure 1. Europe: zones of 200 km and the central region [Rutkis (ed.) 1967]. 1 – Estonia, 2 – Latvia, 3 – Lithuania.

Wide and close contacts with quite different peoples, as well as contacts between these peoples themselves, have strongly affected both Latvian history and geography. Germans and Russians have exercised especially far-reaching influences. On the other hand, Latvia's people and cultural landscapes can hardly be imagined without Swedish and Polish influences, and the extensive effects of the neighboring Lithuania and Estonia are very important. In general, Latvia belongs to the Western cultural realm, but East-European values are also well known and to some extent accepted.

As for the diversity of its nature, it lies at the intersection of two significant physical geographical borders in the Baltic region. These are the borders connecting, on the one hand boreal and nemoral zones, and on the other hand regions dominated by oceanic and continental air masses (Figure 2). Only 13,000 years ago the ice cover melted, and natural landscapes still keep most structural features created by the quaternary continental glaciation.

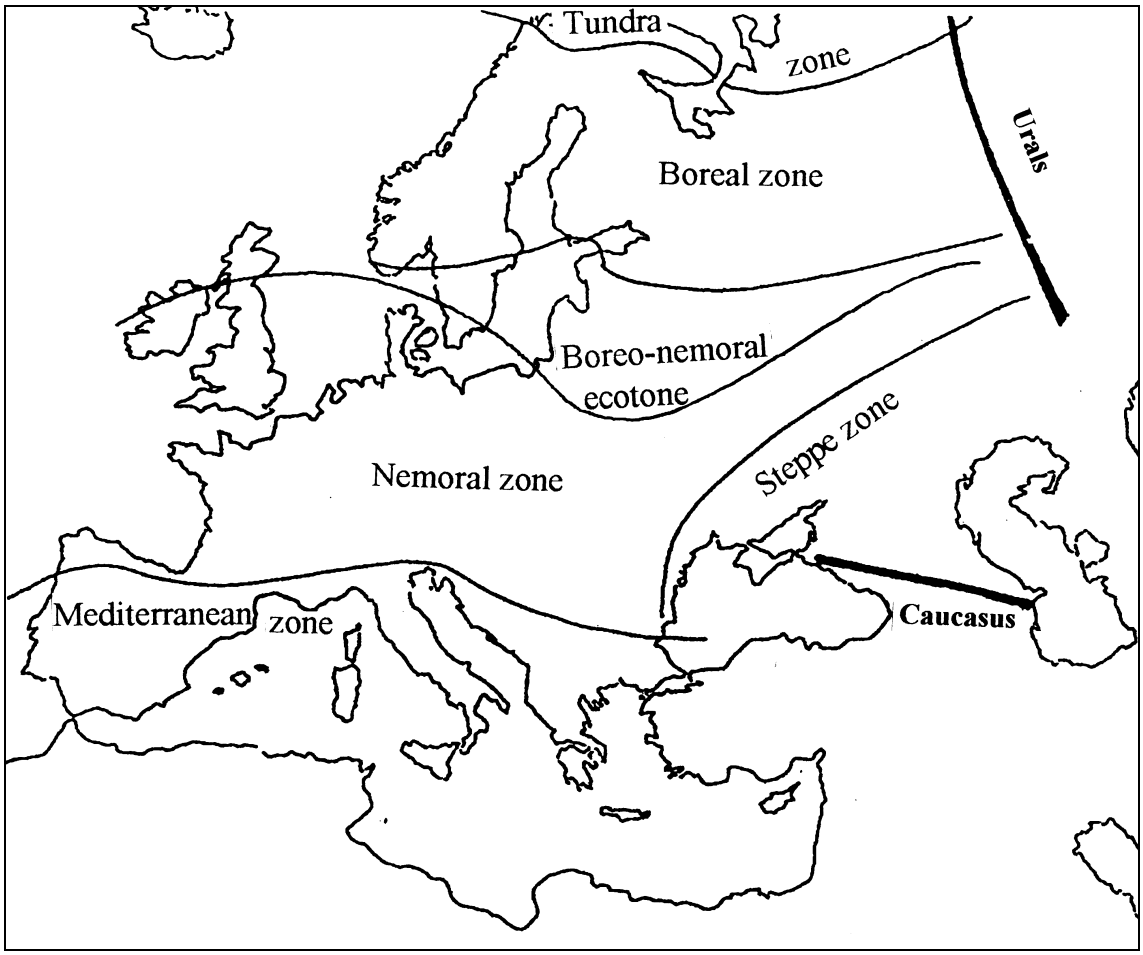

Figure 2. Nature zones of Europe [after Ozenda 1994].

During the ninth millennium BC, when landscapes transients from subarctic tundra to light pine and birch forests were predominant, the first human beings entered the current Latvian area. They were Paleolithic hunters, and their impact on the environment was negligible. However, during the third or even the second millennium BC, i.e. shortly after the warmest and wettest postglacial period with a dominance of nemoral (broad-leaved) forests, those tribes that knew land cultivation settled in and began clearing woodland for tillage. Nature and man have since formed Latvian landscapes together, and the diversity of the country has grown strongly under the influence of human activities [Boruks 1995].

A young nation with an ancient cultural heritage

The Indo-European tribes that introduced the era of agriculture into Latvia on the eve of the development of contemporary boreo-nemoral ecotone were the ancestors of contemporary Latvians. However, Latvia only emerged late as a state on the world map in the 20th century. The country gained independence at the end of World War I (1918) when the Russian and German monarchies were crushed. Despite huge losses and devastation caused by the war, the new democratic state developed successfully. [Gulbis 1931; Lettonie 1939; Latvijas zeme 1936-1937]. Soon its economy reached the average European level, but this period of

independent development was short since Latvia became one of the first victims of World War II.

The unlawful powers – both Nazi Germany and Communist Russia – subjected the country to cruel violence. The Soviet Army occupied Latvia from 1939 to 1940 in accordance with the initial bilateral agreements of collaboration and division of the spheres of influence between the later bitter belligerents. The Soviet forces had already been driven off by German troops in 1941, but in 1945, when the Nazi State collapsed, Latvia passed again into the hands of the Soviet Union until the fall of the Communist Empire in 1991. As a result Latvia lost one-third of its population.

Latvia was even able to withstand such repression, extensive Russification, and the efforts of the Communist education system during the post-war occupation. Moreover it was also able actively to expedite the struggle for freedom and democracy in the rest of the former Soviet Union. The late 80s and the beginning of the 90s were the years of a democratic national awakening movement in Latvia. Putting its "spirit power against the military power" (often referred to as "the singing revolution"), Latvia and the other Baltic nations regained their independence in 1991.

The Latvian State has in essence functioned for some decades. Even so several ancient features are also characteristic of the Latvian cultural tradition. The Latvian language, like the Lithuanian, is among the oldest living tongues in the Indo-European family. The Latvian cultural heritage, in its turn, is rich in folklore – especially in its original folk-songs – preserved until now, even penetrating every day life, professional art, and the Latvian manner of thinking. A love of the rural life and good feelings toward the wilderness are also more widespread in Latvia than in many other European countries. Single homesteads are by far the most widespread form of rural settlement in Latvia. They are an immanent element of the typical Latvian cultural landscape.

At the same time Latvia is a modern nation receptive to both real achievements and the side effects of progress, thereby engaging in challenging scenarios for the future. Being a young nation it is still faced with issues of the past. Diversity has been caused by its history, and the harmonization of these complex relationships with contemporary developmental trends is one of the most sensitive problems in Latvia today.

A country with a complex history

Before our Latvian ancestors, Ugro-Finnic tribes of the Uralic language family arrived in the Baltic area. They were the ancestors of the Estonians and the Livs, and the latter inhabited Latvia's north-western and middle regions for a long period; however, during the last centuries the Livs were almost fully assimilated by the Latvians, and today they are only a very small historical minority.

The Livs have given the common name Livonia to Latvian and Estonian lands that were conquered in the 13th century AD by crusaders and incorporated into the Holy Roman Empire. During these centuries the development of statehood for the Baltic peoples was interrupted. Vanquished "in both ecstatic rapture and fierce hatred and cruelty" by "the iron-clad feudal knight, the international citizen, as he was called and as he felt himself", these peoples were in the shadows of history for a long time [Rutkis (ed.) 1967:8].

Livonia integrated into Europe's cultural and economic space and acquired a social structure typical of the rest of Europe [Dribins, Spārītis 2000]. Germans, including a limited number of local people who had abandoned their identity, had Livonia in their power. Although they never reached 10% of the total population, the Germans kept their key position for the most part until the 20th century.

German Livonia was however already disintegrating in 1561, caused by the military onslaught of the army of the Russian Czar Ivan the Terrible. The Russian attack was beaten back with the aid of Sweden, as well as Poland and Lithuania, but a long-term Polish-Swedish war arose. As a result three main separate territorial units were established in the Latvian area: Swedish Livonia (present Vidzeme), existing until 1721; Polish Livonia or Inflantia (Latgale), existing until 1772; and the Duchy of Courland (Kurzeme and Zemgale) as a Polish vassal state, existing until 1795 (Figure 3).

Some noteworthy events of the 17th century are important for Latvian history. In particular, political and economic order was reformed significantly in Swedish Livonia; the reforms furthered progress in agricultural production as well as in extending the rights of Latvians and Livs, and they considerably limited the feudal arbitrariness of the conservative German gentry. In its turn, Courland launched shipbuilding and seafaring. Couronians could be met on the shipping routes of the world's oceans; they reached distant lands and even tried to found their own colonies (Tobago Island in the Caribbean, Gambia in Africa); of course, the duchy was closely involved in trade and cultural contacts with European countries.

Figure 3. Latvia's territory in the 17th century [Latvijas Ģeogrāfijas atlants 1999].

During the 18th century all the Latvian lands were incorporated into the Russian Empire. Incorporation began with the horrors of the Great Northern War, perpetrated by the Czar Peter I "to hew out a window to Europe". Afterwards the majority of Baltic Germans accepted the Russian intentions, and in these years the parts of the former Livonia became, each in its own way, separate Russian governments or provinces; they did manage to retain their former borders. Moreover, two of the new provinces – Couronia and former Swedish Livonia or Vidzeme – kept particular autonomy and unlimited rights to contact with Germany; German remained an official language. At the same time, Baltic Germans obtained wide opportunities to influence Russian politics and economy, expanding their own activities over all of the Empire.

These autonomic rights did not apply to the former Polish Livonia, Latgale. This province was subjected to Russification, and its economic and societal development was considerably different. The Roman Catholic Church, to which both the Poles and the Latvians (Latgaliens) belonged, weakened the Russian impact; the Church also increased the difference between Latgale and other mainly Lutheran Latvian lands.

During the last decades of the 19th century the Russian government deminished the German autonomy and started increasingly to Russify Vidzeme, Zemgale and Kurzeme. The Latvian territory however never did become a real part of Russia. During the second half of the 19th century the Latvian national awakening expanded, and professional Latvian literature, art and music started to rise. Latvian intellectuals, scientists, technical specialists, entrepreneurs and politicians gradually gained in reputation and influence on a par with German and Russian colleagues. In such a way, Latvia came out of those "shadows of the history", which had lasted almost seven centuries, announcing itself as a future nation.

In 1897 the composition of the population was as follows: Latvians 68.3%, Russians 7.9%, Jews 7.4%, Germans 6.2%, Belarussians 4.1%, Poles 3.4%, and others 2.7%. It is also

noteworthy that Latvian lands were associated with the most developed and educated regions of the Empire. In the 1890s, 95% of persons older than 10 years were literate in Vidzeme, approximately 90% in Kurzeme and Zemgale, about 50% in Latgale, but only 15-30% in the neighboring Russian regions of the Pskow and Vitebsk governments [Latvijas vēstures 1998]. Such indicates the national basis after World War I for winning and realizing state independence from 1918 to 1920.

The second Russian period, which followed Latvia's independence in the 20s and the 30s, basically changed both the ethnic structure and the political and economic background of the country. It began with the repatriation of almost the whole Baltic German population (63,000) from 1939 to 1941. Further 150,000 Latvian refugees (among them the majority of the country's intellectual elite) went to the West from 1943 to 1945 [Latvijas Ģeogrāfijas 1999]. Even so in 1941 and from 1944 to 1953, 180,000 persons (Latvian patriots, most successful business people, and people of liberal and democratic conviction) were deported to Siberia and other "GULAG isles" of the Soviet Union. Finally, when World War II ended, a massive (both organized and spontaneous) immigration from the Soviet Union burgeoned (Figure 4). The military and numerous others, engaged in consolidation of Communist power and the Russification of the country, were a considerable part of the newcomers.

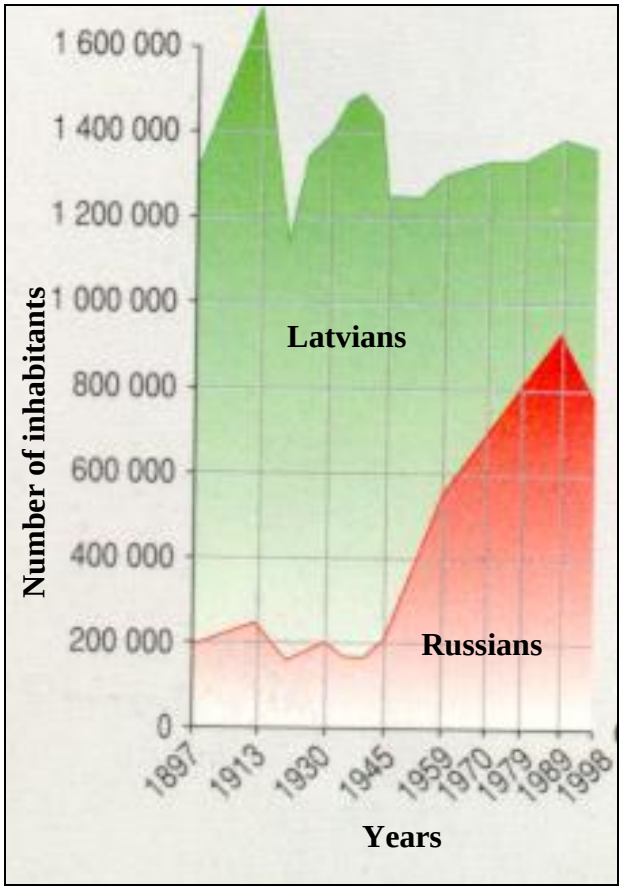

Figure 4. Number of Latvians and Russians in Latvia during the 20th century [Latvijas Ģeogrāfijas atlants 1999].

As a result Latvians almost became an ethnic minority in the own land. In 1979 they were 53.7% of the population, Russians 32.8%, Belarussians 4.5%, Poles 2.5%, Lithuanians 1.5%, Jews 1.1%, Germans 0.1%, and others 1.1%; even ten years later, Latvians' proportion was down to 52%, and Russians' had grown to 34%. A sense of the endangered national identity mobilized people both in the country and in exile to defy more resolutely the Communist power. The national activities in Latvia became an internationally admired and supported part of a worldwide movement for democracy, freedom and the dissolution of the Communist strongholds from the cold war period.

Latvia's people have grown, and Latvian cultural landscapes have formed in the conditions of different ethnic groups living together. Even during the later pre-war period of the national independence development Latvians were only 77% of the inhabitants of the country in 1935. They have however always outnumbered considerably not only each of the other groups but also all the other groups in total. In the course of their history Latvians have accumulated a long-term experience of ethnic tolerance and intercultural cooperation in their society.

Surely, the historical "adventures of the Latvian people" [Ģērmanis 1990] have much helped to overcome the post-war occupation and to search for further good contacts with Russian population, and to find acknowledgement from and favor with the most influential democratic states and the many other nations of the world. The revival of historical ties with Scandinavian countries and Germany, as well as expanding new interactions with the nearest neighbors Estonia and Lithuania, are trends of especial significance. These are countries that form a common region in terms of both human and natural geography. They also have common societal and ecological experiences that can be very useful for the realization of sustainable development in the Baltic area as well as in all of Europe.

Natural background

Latvia's territory is located almost in the very middle between the northern and southern as well as between the western and eastern borders of the boreo-nemoral ecotone of Europe (see Figure 2). At the same time it belongs to the broadest link of the intermediate area connecting the boreal coniferous and nemoral deciduous forest zones. Both to the west and to the east of Latvia, this zonal area shrinks. Its broadest part, stretching from southern Finland to north-eastern Poland, seems to be a region of nearly balanced frequency of oceanic and continental air masses [Krauklis 1999]. Latvia may therefore be regarded as one of the most typical and representative territories of Europe's boreo-nemoral ecotone.

Nature in Latvia is quite northern in character. Winter here is not only a cold, but also a dusky season. At the winter solstice (late December), the sun rises only about 10 degrees above the horizon, daylight is present for only some six hours, and even in the middle of the day, the net radiation is close to zero. At the summer solstice (late June), the sun rises to 55-57 degrees above the horizon in the middle of the day, and daylight prevails for some 18 hours. The net radiation during this period of time is high (Figure 5).

There is a distinctly large difference between the course of net radiation and the course of air temperature. The number of hours each year during which there is positive net radiation is one-third lower than the total amount of time when the numerical values are negative, while the air temperature is above zero (Celsius) twice as long as it is below zero (see Figure 5). These data show that as a result of the global air mass circulation, Latvia receives quite a lot of additional warmth from the Atlantic Ocean.

For three months of the year – from late November or early December until March – Latvia has a more or less permanent snow cover, ice forms on the surface of rivers and lakes, vegetation is in a state of dormancy, and the activities of animals are very limited. Moreover, most species of birds migrate from Latvia during the winter. It is only around the spring equinox (the end of March) that the twenty-four hour balance of solar energy becomes positive, the snow melts, the ice begins to break up in the rivers, and the flood season arrives. Migratory birds return to Latvia between March and the end of June. Vegetation comes back to life in April, but the countryside really becomes green only in May, remaining so until September.

During the "truly green" period, lasting for about four months, the average twenty-four hour temperature stays above 10 degrees Celsius, while during the warmest season, from late June until the end of August, the average is about 15 degrees. In late June and early July, most species of plants have already completed the period during which their biomass increases significantly; they bloom, and the development of seeds and fruit is emphasized. Plants accumulate substances that they need for their further development. In late July and early August leaves lose rich greenness and even begin gradually to die. By the fall equinox in late September, the landscape is colored light gray, yellow and red. Leaves begin to fall – a process, which reaches its culmination in October and is done by November. Birds take wing again; yet, the first travelers have left as early as July, the last in November.

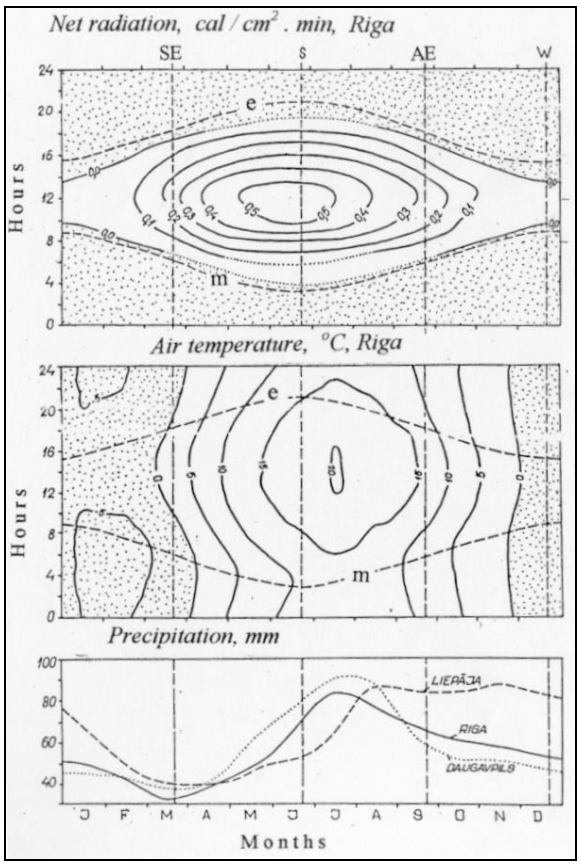

Figure 5. Diurnal and annual course of some climatic elements. SE – spring equinox, S – summer solstice, AE – autumn equinox, W – winter solstice, m – sunrise, e – sunset.

The great variety of landscape conditions in Latvia is multiplied even further by differences from year to year, especially during the winter. Over the last twenty years there have been several winters during which the air temperature has been below -20 degrees Celsius for longer periods of time, but far more common have been warm winters without a permanent snow cover in most of Latvia. During the summer there have been years when the weather has been very dry and hot, with vast forest fires. Other years the summer has been rather cool and rainy, and occasionally there has even been nighttime frost. The date on which the last spring frost and the first autumn frost arrive has varied greatly, as have other major seasonal indicators. This cannot help but have a serious effect on the biomes, the relationship among various species in the ecosystems, and the character of Latvia's landscape in general.

Generally speaking, Latvia is in a climate zone where cool and damp weather prevails. The following numbers provides a very generalized look at the relationship between heat and moisture in Latvia. The annual sum of net radiation in Latvia is 35-40 kcal/cm^2, 80% of the solar energy received goes toward evaporation, and only 20% of the energy remains to increase air temperature. Annual precipitation in Latvia is 600-800 mm, which exceeds potential evaporation by approximately 1.5 times. Real evaporation reaches 67% of precipitation, while the remaining 33% of precipitation runs off into the soil and the deeper parts of the earth, and also into the rivers, lakes and the sea [Latvijas daba 1994-1999].

The cool and damp climate in Latvia ensures a wealth of water in the landscape. Approximately 3% of Latvia's territory is covered by lakes and rivers, 10% by mires, and at least twice as much as that by wetlands with high groundwater levels or impeded surface run-off. The great amount of water that does not evaporate increases the leaching of mineral nutrients from the soil. In hilly landscape areas, which represent no less than two-fifths of Latvia's territory, the water can cause powerful erosion of soil at the tops and steep slopes of

hillocks as well as an intensive accumulation of the washed-off materials in depressions and valleys.

Latvia's heterogeneous sedimentary cover of glacial origin serves greatly to promote variety in nature; the clay, silt, sand, gravel and rocks that the ice and its melting water left behind are found in many differing combinations. Hilly landscapes are the areas of particularly heterogeneous and different soil parent material. The height of hillocks is from a few meters to 60 or 70 meters above the bottoms of the depressions between them. Both hillocks and depressions are of various forms; the latter are often filled with lakes.

Landscapes of this kind exist mostly in Latvia's uplands. Also one of Europe's most impressive marginal formations from the Ice Age passes through here – the lake-rich Baltic ridge, which forms a half-circle around the Baltic Sea from Denmark to the southeastern parts of Latvia. The uplands are almost like islands in the midst of surrounding lowlands that are mostly flat or slightly hilly (Figure 6). Latvia's highest point is just 311.6 meters above sea level, and only 2.5% of the country's territory is above 200 meters; 57% is lower than 100 meters above sea level [Latvijas daba 1994-1999].

The seaside territories of Latvia are the lowest and also the youngest. Here we find accumulative areas of sandy flats, ranges of dunes and large areas of mires. This is particularly true along the southern reaches of the Bay of Riga, where the three largest rivers in Latvia – the Daugava, the Gauja and the Lielupe – all flow into the bay. Other seaside areas, which have been severely affected by abrasion, are more common on the eastern shores of the Bay of Riga. They are found also along the western edges of the bay as well as on the shores of the Baltic Sea proper. Abundant boulders, which remained when all of the fine earth of glacial deposits was washed away by the breakers, are characteristic of these landscapes.

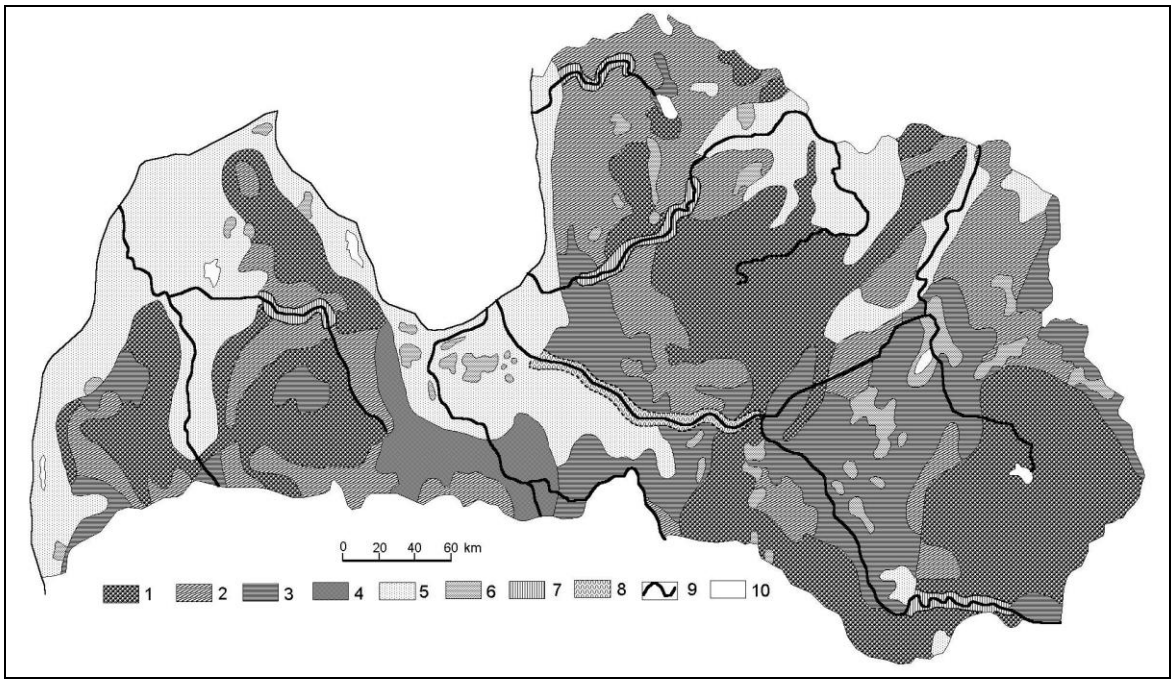

Figure 6. Landscapes [after K. Ramans in Latvijas atlants 1992].

Boreal and boreo-nemoral landscapes – now forests, now agricultural lands: 1 – hilly areas with different soil parent material (mainly loam and sandy loam); 2 – wavy plains with boulder loam, 3 – flat plains with loam. *Landscapes of nemoral affinity* – mostly agricultural lands: 4 – plains with calcareous loam. *Landscapes of boreo-atlantic and boreal affinity* – mostly forests 5 – sandy plains and dunes. *Others:* 6 – mires; 7 – dales (deep wide valleys); 8 – valleys with artificial water reservoirs of hydroelectric power stations; 9 – rivers; 10 – lakes.

Deep and broad river valleys or dales form especially attractive landscapes in Latvia. Basically these landforms date back to the period before the Ice Age. The 80-meter deep Gauja valley, the so-called Vidzeme Switzerland, with steep slopes that are broken up by numerous

tributaries and smaller ravines, is favored by both local people and numerous visitors. The same could be said of the very impressive ancient valleys along the Abava, "the Kurzeme Switzerland", as well as along several stretches of the Daugava (the Arcs of the Daugava upstream from Daugavpils). There are also many smaller rivers and even streams in large ancient valleys.

The terrain in these areas is extreme, and there is a great deal of erosion, material transfer and accumulation. The steep slopes of the valleys, as well as in some instances the beds of rivers, occasionally reveal pre-quatenary rocks, mostly sandstone and dolomite. In other parts of the country, the bedrock is covered with a deep layer of sediment left behind by the Ice Age (more than 100 meters in depth in the uplands of the country). Layers of the pre-quaternary age are therefore all but excluded from the natural matter and energy exchange in most of Latvia's landscapes.

Mires are found in virtually all of Latvia, but most of them are small or even tiny. However, there are also large tracts of fens and raised bogs in the flatlands and the wavy flatland areas (see Figure 6). These, like other parts of Latvia, have a highly varied and heterogeneous ecological structure.

Ecological patterns in landscapes

In more than 85% of Latvia's territory, forests would be the vegetative cover if everything were left to nature. The only parts of Latvia in which forests could not completely replace other ecosystems are the mires as well as some areas in river flood-planes, on the beaches of the sea and the lakes, and in a few other specific sites. As was noted previously, Latvia's forest ecosystems belong mostly to two biomes – the boreal and the nemoral. The territory is only partly appropriate for the pure existence of either of them, so that communities of more or less mixed composition are widespread.

The climatic background is rather similar throughout all of Latvia, and ecosystem diversity here is caused mostly by variety in the parent material determining contents and availability of the nutrients as well as some other qualities of the soils (Figure 7). In other words, the diversity of natural ecosystems of Latvia results from the "refraction" of the natural zonal and regional background by the local variety of landforms and superficial deposits.

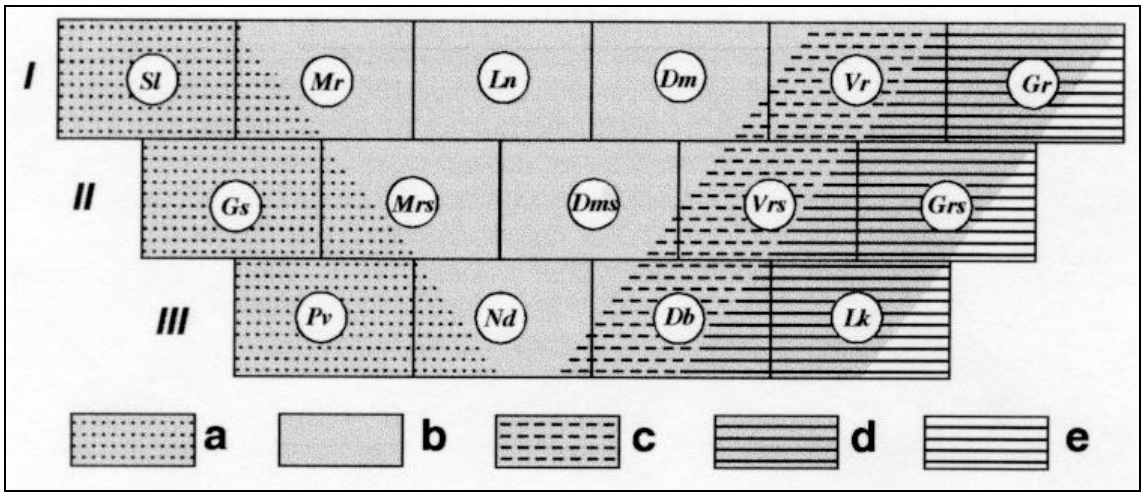

Figure 7. Ecosystems and habitat types.

Zonal-regional affinity of climax ecosystem types: a – boreal forests with heather (boreo - atlantic affinity; b – boreal forests; c - boreal forests with nemoral species in lower strata vegetation; d – boreo-nemoral forests (both boreal and nemoral species in tree layer); e – nemoral forests.

Habitat types [Bušs 1981]: I – dry soil forests (Sl – *Cladinoso-callunosa*, Mr – *Vacciniosa*, Ln – *Myrtillosa*, Dm – *Hylocomio*sa, Vr – *Oxalidosa*, Gr – *Aegopodiosa*); II – wet mineral soil forests (Gs – *Callunoso-sphagnosa*, Mrs – *Vaccinioso-sphagnosa*, Dms – *Myrtilloso-sphagnosa*, Vrs – *Myrtilloso-polytrichosa*, Grs – *Dryopteriosa*); III – forests on wet peat soils (Pv – *Sphagnosa*, Nd – C*aricoso-phragmitosa*, Db – *Dryopterioso-caricosa*, Lk – *Filipendulosa.*

The non-calcareous parent material, including all three of the fine earth particles (sand, silt and clay) and enabling a considerable cation exchange capacity of the soil, is appropriate for ecosystems of the boreal biome dominated by the spruce (*Picea abies*) and the pine (*Pinus sylvestris*). Albeit some nemoral species of caulescent plants, shrubs and trees are also found in a limited abundance in these habitats, and in recent times their presence is increasing.

Nemoral species, such as the oak (*Quercus robur*), the ash (*Fraxinus excelsior*), the linden (*Tilia cordata*) and a few others, dominate in those ecosystems that have soils of calcareous parent material or are enriched with nutrients by minerotrophic groundwater. Also such soils are rather similar to the ones of the nemoral zone, from the ecological point of view. For all that, the nemoral affinity is characteristic more of the herb and sub-canopy layers than of the canopy layer. The latter is often mixed, i.e. consisting of both broad-leaf trees and conifers.

In sandy soil with a low content of active particles (colloids, clay and fine silt particles), the amount of nutrients is quite low as long as there is no input from minerotrophic groundwater at the site. Boreal species dominate here without any particular participation by nemoral species in terms of the communal structure, the composition and turnover of the organic matter, and the properties of the soil. But in the poorest soils, developing from the eolic sand or the moss peat of raised bogs, pine of very low productivity and heather (*Calluna vulgaris*) are most common. These ecosystems may be classified as being of a boreo-atlantic affinity [Krauklis 1999].

Spatial proportions of the habitat types mentioned above have been surveyed only in the areas used as forest lands [Laiviņš 1997]. The data encompassing the country in toto are lacking so far. Approximately one third of its territory has habitats of the ecosystems with boreo-atlantic and "pure" boreal types. The same or a bit higher is the proportion of the habitats enabling the existence of the boreal ecosystems with some presence of nemoral features. The rest has potential or actual areas of typical boreo-nemoral and nemoral ecosystems.

As a rule, a wide variety of the habitat types exist within each actual landscape. The highest diversity of habitats is a feature of the landscapes of dales and hilly areas (see Figure 6). Sometimes almost all the types considered are found even in quite small areas. Flatlands and wavy flatland landscapes are less heterogeneous, e. g. the nemoral landscape of the Zemgale plain to the south of Jelgava. A great deal of landscape diversity however is sometimes caused and sometimes removed by human activities and the developing cultural landscapes in Latvia. A key issue in the management and establishment of cultural landscapes ought to be a comprehensive exploration of the natural ecological potential of the habitat types and the recognition of the ecological patterns in the landscapes in the context of land-use development.

Human activities within landscapes

Today woodlands cover only slightly less than half (45%) of Latvia's territory, and 39% of it is agricultural lands [Latvijas vides pārskats '97 1998] (Figure 8). Proportions of the land use forms differ essentially in the habitats of differing natural ecological potentials. Human activities have forced forests almost completely out of nemoral-type ecosystem habitats, and now these areas have been turned into agricultural land (mostly arable land). Forests dominate when it comes to land that is not appropriate for agriculture and is typical of the boreal-atlantic type of ecosystem. In the boreal and to a lesser extent boreal-nemoral types of ecosystems in Latvia there are both forests and agricultural lands; the way in which land is used depends not only on nature, but also to a large extent on economic and societal factors.

Latvia is not a densely populated country – the average density is only thirty-eight inhabitants per square kilometer. But 69% are residents of towns that cover a very small part of the territory, so that the population density in about a half of the country's area does not exceed ten inhabitants per square kilometer (Figure 9). Those areas are mainly landscapes of the boreal and boreo-atlantic types, rich in wetlands and water. The largest urban areas of Riga (800,000 inhabitants), Liepaja (95,000), Ventspils (47,000), Jurmala (59,000), as well as part of Jelgava (59,000), and even Daugavpils (115,000) have the same landscape type. Density of the rural population is high in nemoral landscapes (Zemgale), but the other landscape types are densely populated in the areas around the large towns mentioned, as well as along the main thoroughfares and especially where they intersect (see Figure 9).

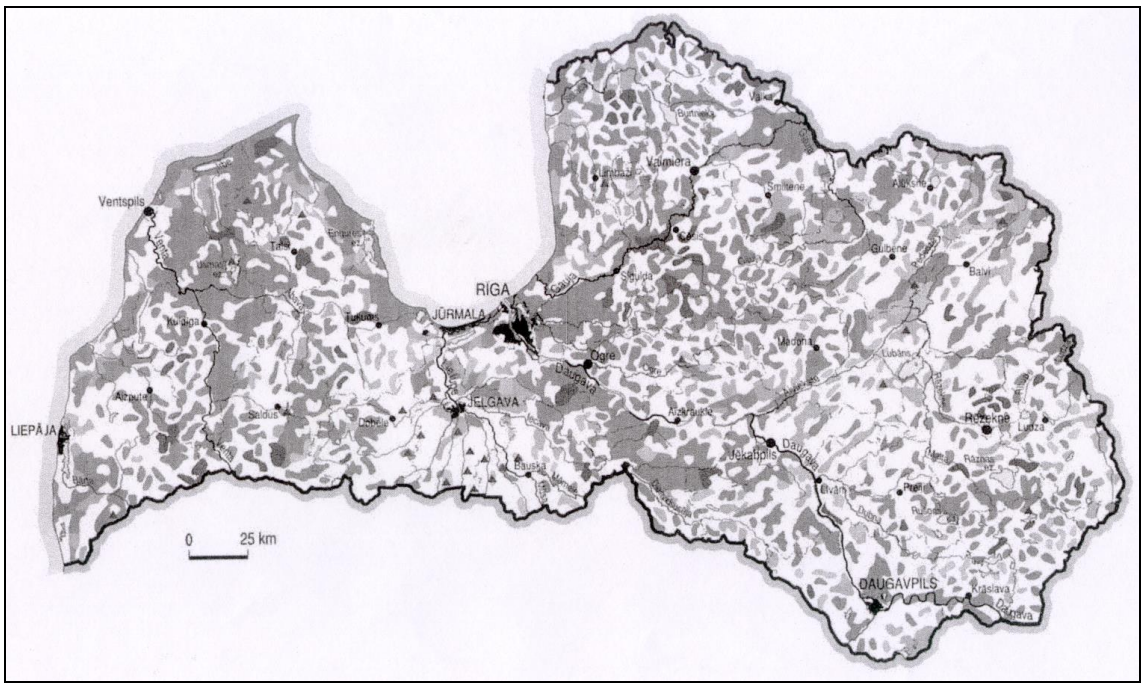

Figure 8. Land use: forests (gray of different intensity), arable lands, meadows, pastures and other open areas (without shading), urban areas (black) [Latvijas Ģeogrāfijas atlants 1999].

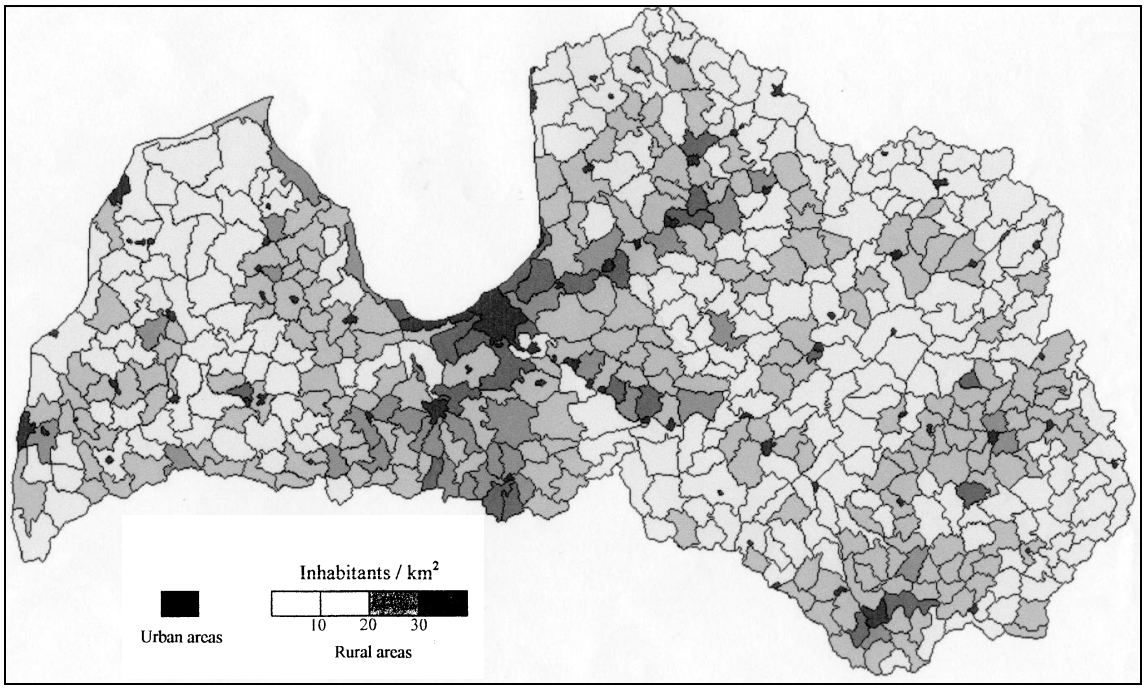

Figure 9. Density of rural population [map compiled by A.Vilciņš].

There is still much room for the existence of wilderness in Latvia, and also the biological diversity remaining is considerably better than in the majority of European countries [Latvijas vides 1998]. Some bird and mammal species, which are endangered in Europe and even in the world, have a large part of their total number in Latvia. Those species are, for instance, the black stork (*Ciconia nigra*), the corn-crace (*Crex crex*), the crane (*Grus grus*), the beaver (*Castor fiber*), the otter (*Lutra lutra*) and the lynx (*Lynx lynx*). That is an important advantage

for Latvia in the development of a sustainable economy, but it has not really been assessed. At the same time very much needs to be done to ensure environmental protection in the context of the current and future efforts towards the development of production, infrastructure, tourism and leisure activities in both urban and rural landscapes. The search for of creative goal-directed complement to the stated trends and practical involvement of people in shaping their cultural landscapes is a burning issue today [Krauklis 1999].

Diversity and transition period

Since restoration of its independence, Latvia has made great progress in developing democracy and modernization. In these years a very important achievement has been participation in European and global political, economic and cultural processes; however, a number of complex problems of the transition period have emerged. One of them is the integration of the large number of people who migrated to Latvia during the Soviet period and their descendants. This process is very slow. Since Russia's attitude towards Latvia is unfavorable, sometimes even aggressive, it is difficult to accelerate the integration. However, the most challenging problems are as follows:

(1) Industry and agriculture that were deeply integrated with the centralized Soviet super-power economics turned out to be nonviable; yet, industrial output under the conditions of market economy and democracy has developed too slowly. Consequently, the level of real earnings of the inhabitants is rather low, entailing social and political complications;

(2) The development strongly depends upon foreign investments and successful cooperation with foreign partners, but collaboration among the regions inside Latvia is weak;

(3) Cooperation with Russia is tenuous. The main economic link is Russia's oil transit through Latvia's ports. That link and the difficulties with the naturalization of the Soviet period migrants are used to exert pressure on Latvia;

(4) The natural increase of the population has become negative and is among the lowest in the world. At the same time differentiation in the society is increasing, and new conflicts of interest among different economic, societal, political and other groups must be taken into consideration.

In terms of development and its entailed problems, there are great differences between (1) the capital Riga and the rest of Latvia, (2) the urban and the rural areas, and (3) Latgale and the other regions. A characteristic index revealing regional differences is average earnings. In Riga and its environs the average monthly salary is 130-160 Ls per month (1998), in other regions 90 to 120 Ls per month; in cities it is higher than in rural areas; the lowest average salary (80-90 Ls per month) is in the eastern region, Latgale [Latvijas 1999].

Since almost one third of Latvia's inhabitants are concentrated in the capital city, foreign investments are mainly attracted there; national economic and intellectual potential, as well as infrastructure concentrate there. Riga is called the motive power of the nation; this particularly refers to information technologies, electronics, pharmacy and other knowledge-based branches. Its actual contribution to enhancing development in other regions is however yet modest: when speaking about Latvia's development, one usually means the development of Riga.

The development of other cities hitherto seems to be primarily based on collaboration with partners abroad, not with Latvian partners; the impact of towns and cities upon the surrounding rural areas is also yet small. A striking example of such "extraterritoriality" is Ventspils, a port on the coast of the Baltic Sea. Although this center of transit business is notable for the highest average salary in Latvia (above 200 Ls per month), no development of the neighboring rural areas (*pagasti*) can be observed.

The future of rural areas is particularly unclear, although the land is almost privatized. Latvia's agricultural production has lost the pre-war markets of Britain and Germany, as well as the post-war market of the former USSR. Moreover, it has to compete with foreign products in its own local markets. The technological processes are hampered. The land, being mainly divided into small properties, is inadequately utilized. The number of successful agricultural producers is insignificant. Presently the highest economic activity in rural areas is in woodworking; the expansion of woodlands is already being done at the expense of agricultural

lands. There are some attempts to develop biodynamic, ecological and other alternative forms of agriculture; rural tourism is also being sought.

Regarding regional development, the greatest concern is about the eastern part of Latvia, Latgale. According to the 1998 data [Latvijas Ģeogrāfijas atlants 1999], it is notable for the lowest earnings, the lowest employment (unemployment 14-30%, while in the rest of Latvia 4-14%), the greatest number of pensioners (28-31%, in the rest of Latvia 22-28%), and the highest level of depopulation (from -8 to -14 per thousand, while in other regions -2 to -7 per thousand).

There is the largest ethnic heterogeneity in Latgale; it has been most strongly subjected to Russification both during the Czarist Russia and the Soviet Empire periods. In several parishes (*pagasti*) almost all inhabitants are Russians, in some Belarussians; yet, there are a large number of parishes with a dominance of Latvians. Although ethnic peculiarities have an indisputable effect on regional development, they cannot be considered the reason for this underdevelopment. A similar ethnic heterogeneity also exists in Riga and others of the largest cities, where the development is more successful; the proportion of Latvians in these is less than half. However, a certain likeness can be seen in political manifestation of the post-Soviet reality, as became evident during the last Parliamentary election (1998). In many parts of Latgale the parties of pro-Communist and pro-Russian orientation were quite popular, and these also gained considerable success in Riga, while in the rest of Latvia their influence was close to zero.

Thus, in Latvia the diversity is both a promoting and a hindering factor for development, and often these effects are inseparable. An unquestionable condition for progress is the careful study of diversity and its appropriate treatment. Such an action should result from the above facts of Latvia's geography and history, but even more from the current challenges. In this sense, the motto of the 29th International Geographical Congress "Living with Diversity" is both topical and very relevant for Latvia.

The Congress in Korea will not only stress the problem, but it might well become the onset of new encouraging and creative international efforts, both in the field of scientific study and the practical harmonization of the geographical diversity on a global, regional and local scale.

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Indicators of Sustainable Development as Signals of the Development of Society

Kristīne Āboliņa and Māris Kļaviņš

Introduction

Modern society involves not only considerable progress in technological and natural resources, but also very serious and global environmental problems such as the destruction of the ozone layer, global warming and diminishing biological diversity [Brown et al. 1991:18-22; Brown 1997; Miller 1996; Mannion, Bowlby 1992]. These are all situations which can have a notable effect on the survival of humanity [White 1994:21-39; Milbrath 1996:291; Meadows et al. 1992]. A sustainable development concept has been elaborated with the aim of avoiding further exacerbation of environmental problems while simultaneously ensuring economic growth opportunities and alternatives in human development [WCED 1987; Goodland et al. (eds.) 1991; IUCN/UNEP/WWF 1991; Miller 1996:716-721]. This concept can to a great extent be seen as a possible paradigm in planning the development of societies.

The classic definition of sustainable development has been given by G.H. Bruntland: "It is development which satisfies today's needs without reducing the ability of future generations to satisfy their needs" [WCED 1987]. Put another way, it is development in which each sphere – the economy, the environment, the society, etc. – is developed in a way which does not reduce developmental opportunities in other sectors. The foundation of sustainable development, it is generally felt, is the principle not of competition, but rather of balance and dependency. The idea is that the economy, the environment and society are inviolably linked to one another and dependent upon one another. The goal of sustainable development is to a large extent to protect the environment and its resources from irrational use.

In Rio de Janeiro in 1992, 150 countries came together to recognize, for the first time, the need for sustainable development at the global level. The "Agenda 21" document [UNCED 1993] was adopted at that meeting as a blueprint for activity in the 21st century. Some countries, including the Netherlands and Germany, have elaborated concrete goals in reducing environmental problems in the world [Adriaanse 1993; Sachs et al. 1998], but for the time being we have seen no specific example of a country moving in practical ways toward sustainable development. The major obstacles which stand in the way of implementing sustainable development schemes in the area of public management include a low level of information among the public, the need to reduce the intensity of consumption, and many other problems which hinder the introduction of such ideas. At the same time, sustainable development ideas are becoming increasingly important for countries that are undergoing economic transition.

The reorientation of cities toward sustainable development is a relatively more simple affair. Urban environments have accumulated problems and related consequences for decades. Cities such as Hamilton-Wentworth in Canada, Lisbon in Portugal, the Hague in the Netherlands, Nagoya in Japan, Leicester in Great Britain and many others have chosen sustainable development as official policy, and this policy is reflected in political decisions, development plans, sector-based development strategies and various development projects, as well as, of course, in practical activities [Gilbert et al. 1996; ICLEI 1997; Stanners, Bourdeau (eds.) 1995; Kendrick, Moore 1995].

The ideas of sustainable development, social development and related planning issues have become of great importance in Latvia. Latvia's National Development Plan, the Riga Development Plan and the Riga Environmental Protection Strategy all list sustainable development as a major developmental goal [LR Finansu 1999; Rīgas dome 1995Rīgas domes Vides 1999].

If sustainable development becomes a developmental goal, the issue arises of how the development processes at the national or urban level can be evaluated. What are the indicators of achievements or failures in this area? In addition to traditional statistics involving social, economic and environmental indicators, many parts of the world are now also starting to look at indicators of sustainable development. These indicators are important to the relevant city or

country as a means for evaluating progress, but it is also true that if sustainable development practice and experience is to be judged at the global level, comparisons are needed. What's more, such indicators are of critical importance in evaluating sustainable development as such. The goal of this article is to help in defining some sustainable development indicators, focusing on their functions and properties and evaluating the likelihood of their application in the evaluation of development in transitional countries.

Definition of indicators

The elaboration and selection of developmental indicators is an important task in analyzing any processes in society and the environment. This is seen most clearly in the definition which has been provided by Rossi and Gilmartin: "Indicators are the repeated measurement of a phenomenon over the course of time, allowing for a view of long-term trends, periodic changes and differences in the volume of changes" [Rossi, Gilmartin 1980: xiii].

Indicators can also be defined more broadly: "An indicator is an empirical interpretation of reality, but it is not reality itself. Indicators are usually used to demonstrate a quantitative statement of a complex situation or process. They can be used to show trends which cannot immediately be perceived in a specific situation. Indicators transform data and statistics into concrete information which is easy to understand and to use by various user groups with various interests – scientists, politicians and the public. Indicators can be correlated, and if specific values are attached to each of them, combined measurement units or indexes can be established [OECD 1997:14].

An example of a simple indicator is temperature. Body temperature serves to indicate the health of a human body. Air temperature designates climate conditions. More complicated but widely used indicators include gross domestic product and the concentration of a specific pollutant in the air.

Sustainable development indicators have been defined as follows [Sustainable Seattle 1993:1]:

- They are information units which specify the status of major systems;
- They are a means for viewing the larger picture while viewing only a small part thereof;
- They show the direction in which a system is developing – up or down, forward or back, becoming better or worse or remaining the same.

As we can see, the definition of sustainable development indicators does not differ very much from the previously mentioned definitions. The main thing is that sustainable development indicators are ones which most clearly, precisely, visibly and fully describe the sustainable development process in specific.

The properties and functions of indicators

In this section of the paper, we will look at the properties and functions of indicators in general, because these also apply to sustainable development indicators.

Among the more well-known properties of indicators are the following [OECD 1997]:

- Indicators reduce the number of measurements and units that are necessary for a full view of a situation. Indicators and their details are limited in terms of number and range;
- They simplify the path of information to various user groups. Indicators can be used to suggest more extensive data collection and analysis. Indicators cannot replace more exhaustive data and information; on the contrary – they are based on such sources.

Canadian specialists have promoted the following criteria in the selection of an "ideal" indicator [IndEco Strategic Consulting, Inc. (ed.) 1995:vii]:

- The ability to use the indicator;
- The ability of the indicator to predict developmental trends in the system;
- The quality of the data in terms of validity;
- Scientific usefulness;
- The ability of the indicator to reflect the complexity of the situation.

It must be noted that there has been a trend in the world to overrate the abilities of indicators – e.g., in terms of their applicability in the evaluation of the consequences of specific policy initiatives. Indicators usually point to the development of a process, but they cannot always be used to determine why a specific result has been achieved. Indicators demonstrate; they do not explain. When indicators point to failure in attempts to reach a specific goal, more detailed analysis is needed to find the causes for the failure, and this involves more data than are contained in the indicator itself. When it comes to problem solving, it is very important to ensure that indicators are "close" to the cause of the problem and that there is a latent period between the activity and its consequences. For example, the emission of freons into the environment causes dangerous consequences only after 50-100 years, so the most effective indicator of specific activities is the amount of freons that have been produced, not the size of the ozone layer (although that, too, is of course important to know).

A second problem in selecting indicators is the way in which their content is interpreted and available to decision-makers. If a decision-maker is to engage in practical action, it is important that the number of indicators and data not exceed the number past which the understanding of relationships in the process becomes difficult [IndEco Strategic Consulting, Inc. (ed.) 1995:vi].

In other words, the number and type of indicators used depends on the target audience. Figure 1 shows that professional analysts and scientists can be interested in highly detailed sets of indicators which are scientifically useful and point to the complexity of the relevant system, but non-specialists usually have problems in understanding such indicators. Decision-makers prefer information which is directly linked to policy goals and developmental evaluation criteria.

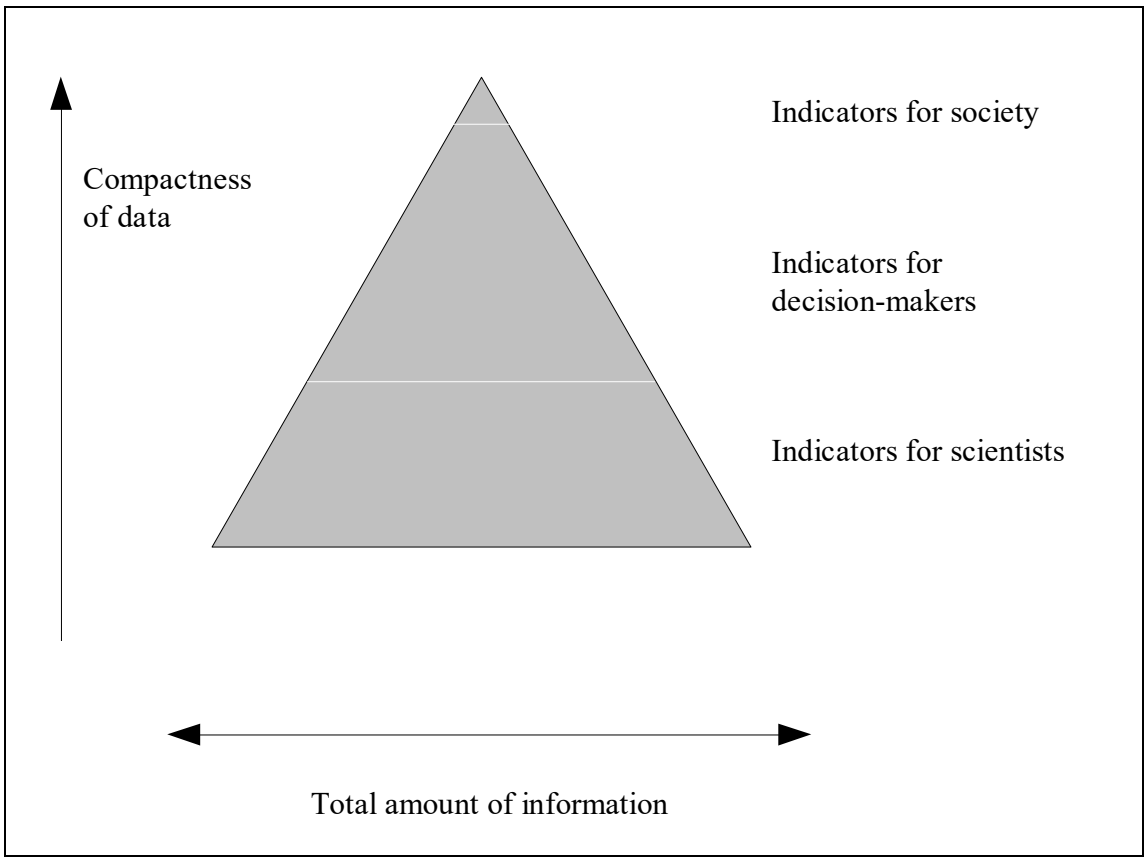

Figure 1. The relationship between the amount of information that is needed by users and the compactness of the data in the relevant indicator [Maclaren 1996].

The mass media and the public are interested in a limited number of indicators – those which can easily be understood and which reflect issues that are of key concern.

In addition to the target audience, it is also important to think about the goal of the process of evaluation. Indicators can serve various goals:

- Finding out the existing condition of the environment, the economy, etc.;
- Evaluating achievements in the pursuit of specific goals;
- Winning wider support for policies;
- Allowing society to see what is being done;
- Placing pressure on governments [Breumelhof 1998:76].

Evolution of sustainable development indicators

When people began to elaborate various indicators of environmental situations, this marked the beginning of the evolution of sustainable development indicators. There are very different kinds of environmental indicators which point to environmental quality, environmental conditions and processes in the environment. Most often we see collections of data about the presence of various pollutants in the environment [CSP/CSBL 1999]. One result of the development of environmental indicators has been the scheme "burden-condition-reaction", where "burden" is defined as the indicators which point directly to the causes for proposed changes in environmental conditions – emissions, pollution, etc. The condition of the environment refers to indicators that focus on environmental pollution and the status of environmental systems. The reaction indicators illustrate the consequences of environmental situations – changes in environmental or even human health conditions [Hammond et al. 1995:11]. Most recently the scheme has been supplemented with another indicator – "driving force" – which takes a deeper look at the reasons for changes in environmental conditions. This is a very logical result to attempts to describe cause-consequence relationships in processes and to mark the causes of problems as specifically as possible. This, of course, makes it easier to solve problems and to take the relevant decisions.

The scheme "driving force-burden-condition-reaction" is the foundation for several sets of sustainable development indicators [Hammond et al. 1995:13; Maclaren 1996], and sometimes it is hard to say whether an indicator is one of environment or of sustainable development. When sustainable development indicators are developed, it is necessary to look at factors which cause changes in the quality of the environment. Among these are human behaviors such as the use of laundry detergents, engaging in industrial processes, using motor vehicles, etc. These can be individual or collective activities. Problems can be solved by liquidating their cause, and as a result of this, when we look for solutions to problems that are indicated by an environmental indicator, we inevitably must cross the traditional boundaries of the environmental sector and find ourselves in the industrial, transportation, household or other sector of activity. This means that one and the same indicator can be used for interpretations in various spheres of activity, and in different ways. If there is a demand for chlorine in a society, for instance, the increased production of chlorine is a positive indicator. If the greater amount of chlorine, however, causes greater environmental problems, this is a negative thing in that it influences human health and the condition of ecosystems.

In situations where governance is implemented on the basis of specific sectors (i.e., when development is planned and managed individually for such sectors as agriculture, industry, transportation, etc. – areas in which mutual integration differs from country to country), a study of environmental problems cannot be based exclusively on environmental indicators, because the causes for these problems are usually found in other sectors. In these cases sustainable development indicators can come to the rescue, because they cover the environment, the economy and the social sector. What's more, the aversion to environmental problems in a situation where there is a sector-based approach to governance requires activity in a variety of sectors and is directly dependent on intersectoral cooperation and understanding of the seriousness of environmental issues in ongoing development.

The difference between sustainable development indicators and environmental indicators

It is difficult to elaborate or select sustainable development indicators, because they must reflect very complicated relationships among the environment, the economy and society. It is also difficult because there are no generally accepted units of measurement in the area of sustainable development – measurements of the type that are represented by money when it comes to economic indicators. In the environment and in society, there are a number of things that cannot be expressed in monetary terms. This means that sustainable development indicators must go beyond quantitative measurements and include qualitative ones, too. These, naturally, involve subjectivity and are based on perception, judgments and values that can be very different among various cultures, groups within one society and individuals. They can also change over time [OECD 1997:15].

An important sign of sustainable development indicators is the fact that they usually come in a set. It is important to ensure that the set is complete and that the basic principles of sustainable development are observed [Holbmerg 1995:13-16; Sachs et al. 1998]. One specific aspect of sustainable development, for example, is equality – within a generation and among generations. Sustainable development indicators, therefore, must address this issue. Existing environmental and economic indicators have not done so, and work in this area has been possible only through a comparison of indicators from various countries. This aspect of sustainable development can serve to turn indicators such as increases in the level of consumption of, e.g., electricity from positive to negative indicators. This should make it clear that indicators can be interpreted in various ways – perspective is what it is all about.

Table 1

Differences between environmental indicators and sustainable development indicators

	Environmental indicators	**Sustainable development indicators**
What do they show?	Usually they describe environmental quality or conditions; sometimes with the help of the "driving force-burden-condition-reaction" scheme they also include other economic and social factors.	They cover all spheres – the environment, the economy and society and their mutual relationships.
How do they describe?	The indicators are usually quantitative in nature.	Qualitative evaluations and judgements are often used.
How are they merged?	They emphasize the major aspects, and they usually do not represent a "full set" in describing a system in the widest variety of ways.	They emphasize the aspect of sustainable development, which means that the description of a system requires a full set of indicators.
How are they elaborated?	The indicators are elaborated by environmental specialists.	The indicators are elaborated by a variety of specialists, often in cooperation with the public at large.
Why are they elaborated?	They are primarily of an informative nature.	In parallel to informative and educational functions, they promote the involvement of the public in the processes of sustainable development.
For whom are they meant?	Users are mostly environmental specialists.	Users are a wide range of people, including local residents.

Environmental indicators are usually chosen by specialists, but because an important aspect of sustainable development is democracy and public participation in processes, the development of sustainable development indicators is often a process which involves broad swathes of society [Sustainable Seattle 1993].

When it comes to sustainable development indicators, it is critically important to emphasize their educational function. In many cities in the world these indicators have been selected so as to be as easy as possible to understand, and each year the indicators are disseminated to local residents, thus encouraging interest in the themes which are reflected and in participating in the sustainable development process by giving real support to policy decisions in this area. The following table illustrates the main differences between sustainable development indicators and environmental indicators.

Variety in sustainable development indicators

One of the first set of sustainable development indicators appeared about seven years ago [Sustainable Seattle 1993], but specialists and users still have not come up with a unified opinion about the most effective and best set of indicators. New sets are still being developed on the basis of various basic structures [Azar et al. 1995:4; Maclaren 1996]. This is happening for a variety of reasons:

- The sustainable development process differs from one part of the globe to another, and indicators can be used to point to the specific aspects of the process in a concrete place so as to maintain these aspects or to eliminate them if they represent weaknesses. This means that each location, when evaluating strengths and weaknesses, will surely come up with a different set of indicators;
- The creative aspect of the process of sustainable development has not been the object of a specific "program" of implementation; there are only more or less complete basic principles for sustainable development, and these are implemented through a subjective, creative approach;
- Sets of indicators can vary significantly depending on their target audience and its properties.

Thanks to this approach to the elaboration of criteria, several sets of indicators have been developed, and each of them can be used differently to reflect sustainable development practice in various parts of the world. All of the sets of sustainable development indicators that have been developed have had different target audiences and tasks; they have been elaborated on the basis of different foundations, and accordingly they differ in size and form. There are some sets that can be used only in specific cities, while others can, depending on the availability of data, be used in various countries, cities or populated areas.

The sets of indicators also vary considerably in terms of the compactness and complexity of their data. The number of salmon breeding in local rivers and the number of library users – these are two of forty indicators which are used to illustrate sustainable development in Seattle, Washington. The system uses arrows pointing to the left and the right to indicate progress or regress in relationship to sustainable development from year to year [Sustainable Seattle 1993]. It is important that the first of those two indicators will tell specialists a great deal about the speed at which water flows in the river and the amount of pollution that is in the water, because salmon will breed only in rivers which are not too polluted. The "environmental thermometer" at the Hague, which is aimed at reflecting the existing environmental situation in the city, has an analogous indicator – the number of storks that are nesting in the city [Breumelhof 1998:296]. Such indicators are usually published periodically with explanations that are accessible to anyone.

Azar and colleagues [Azar et al. 1995] elaborated a set of indicators that was based on scientific principles and the system approach [Holmberg 1995:8, 5d]. Without specific explanations, these indicators cannot be understood by non-specialists or policy-makers. One of their indicators, for example, focuses on anthropogenetic flows in comparison to natural flows:

$$I_{2,1} = \frac{E_a}{E_d},$$

where

E_a – represents the level of anthropogenetic emergence of a substance and

E_d – represents the level of natural emergence of a substance.

Now, these indicators are closely related to the goal of sustainable development, but not every policy-maker will even know what "anthropogenetic" means, far less be able to take immediate advantage of the relevant data in his or her work. In collaboration with the authors of this set of indicators, the local government of Gotland Island off the coast of Sweden elaborated a more specific set of indicators [Strid 1996]. One of the results of this process of cooperation was the establishment of ecological declarations for products. Manufacturers use the ecological declarations to state the non-renewable resources that have been used in the production of the relevant product, the carbon dioxide emissions that have been involved in the process, the amount of metals in the product, the amount of electricity, water etc. that is needed to use the product and so forth. These ecological declarations allow the local government to choose products in their procurement process which are as environmentally friendly as possible in their manufacture and subsequent use.

There have also been significant attempts to adapt economic indicators to the needs of sustainable development [Miller 1996:672-673; Markandya, Richardson (eds.) 1992]. One of the most important of these was the creation of a sustainable economic welfare index, which many economists feel to be preferable to GDP as an illustrative indicator. The indicator is based on the per capita GDP figure of a country, but it also reflects inequality in income distribution, the disappearance of non-renewable resources, the drying up of swamps, the degradation of fertile land as the result of erosion and urbanization, the costs which are caused by air and water pollution, and the long-term harm that is being caused to the environment as the result of the destruction of the ozone layer and the presence of global warming in our world.

Another concept which is gaining in popularity is the concept of the "ecological foot", which can be used to show the area of a productive ecosystem in a populated place (city, country) that is needed to provide for everyday needs – procurement of resources and eradication of pollution. The size of this "foot" depends on the consumption level in each area. Annual comparisons of the indicator indicate whether a region is moving toward sustainable development or away from it, and this is a convincing way to provide information to the public.

There are sets of sustainable development indicators which have been developed for specific sectors. Canada, in response to the abstract definition of Bruntland's definition and to the difficulty of including the complex public and economic relationships which exist in a country in a general set of indicators, has elaborated indicators concerning sustainable energy production and use. This, too, is a part of sustainable development. Canada also has sustainable development indicators in the transportation sector [IndEco Strategic Consulting, Inc. (ed.) 1995].

International organizations such as the World Health Organization, the UN, the OECD, the European Environmental Agency etc. have also produced extensive sets of sustainable development indicators. These can be accessed through the homepages of these agencies on the Internet.

Conclusion

The wide variety of sustainable development indicators in our world is a logical result of the different approaches which countries and cities take toward sustainable development. They represent both a benefit and a challenge. The benefit is that we have a wealth of choice in elaborating new criteria and in improving the old ones. The challenge lies in the fact that there must be serious research of whether all of the sets of indicators really are reflecting the most important aspects of sustainable development – aspects such as equality within and among generations, for example. It is important to ensure that sustainable development indicators do not become a matter of fashion and that instead they be used as a serious reflection of achievements and failures on the road to sustainable development – a process upon which the environment of human existence in the future will largely depend. The introduction and use of sustainable development indicators is particularly important in the transitional countries, which need to evaluate their developmental directions and trends. Populist terminology is one thing; actual development is quite something else.

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Latvian Population Mobility In the Transition Period

Andris Bauls and Zaiga Krišjāne

Social-economical changes are reflected in the demographic situation of Latvia and the mobility of its population. Natural demographic processes are closely connected with the development of the nation. The structure of population increase has changed since 1989. It could be explained by the fact that the population growth was based on migration from other republics of the USSR until 1989, and only approximately one-third of the whole population increase was caused by natural growth. The other tendency that took place after 1991 was depopulation. In the beginning of the nineties outflow from the largest cities to rural areas was characteristic for Latvian internal migration, but in the last few years population in the largest cities has increased due to migration. At the same time the largest cities are tending to increase in economic importance; consequently the intensity of daily commuting has changed and the urban areas of daily commuting have been extended. Such a tendency can be observed in the capital of Latvia, Riga.

This report deals with population mobility and its changes in Latvia during the nineties, with particular attention to international and internal migration as well as daily commuting.

International migration

The location of Latvia at the crossroads between Russia and North Europe on the eastern coast of the Baltic Sea with several ports has for centuries determined the interest of neighboring big nations. All the wars and political changes here were followed by massive flows of emigration or immigration. The 20th century has not been an exception. The role of migration in the dynamics of population, both its number and composition, was always more significant than that of natural growth [Eglīte 1997].

Population losses in Latvia in the 1940s by deportation, military and civil population destroyed during WW II, refugees to the West, and decrease in the birth rate during the war amount to some six to seven hundred thousand, or one-third of the prewar population [Šmulders 1992; Zvidriņš 1992]. These losses were replaced and exceeded by migrants from other parts of the former USSR: mainly from Russia, the Ukraine and Belarus. Estonia and Latvia experienced the highest net in-migration not only in the USSR, but also in the whole of Europe. The annual in-migration rate reached six to seven per thousand of population in the 1960s and four to five during the 1970s and 80s.

Within the period 1951 to 1990 2,172,000 people arrived in Latvia or 54,300 people per annum (23%), but the number of people leaving Latvia during that time was 1,802,000 or 45,000 per annum (19%). The net migration from 1951 through 1990 constituted 370,000 people or 9300 per annum (4%). During that period immigration to Latvia was caused by the following: intense growth of industry, which employed the immigrant labor; comparatively high standard of living; better developed services and recreation. The highest volume of migration was to Riga.

The dominant direction of the international migration was as follows: to Riga and to cities of republican significance; to regional centers, where new industrial enterprises were built; to rural areas belonging to the Riga agglomeration.

Since the beginning of the transition from planned economy to that of free market and the beginning of the open movement for regaining state independence at the end of the 1980s, Latvia experienced drastic changes both in directions and intensity of migration.

Beginning from 1991 the demographic situation in Latvia has changed substantially. The demographic situation in Latvia may still be assessed as unfavorable. Latvia's population has ceased to increase numerically. Over the years from 1991 to 1998 the population in the country decreased by 228,000. At the beginning of 1999 it stood at 2,439,000 – 8.5% less than in 1991.

The decrease results not only from mechanical movement but is also due to natural movements. The internal migration of the population has also decreased substantially.

Over the period of the last eight years the direction of long-term migration flows changed in an essential way; emigration grew rather rapidly and the volume of emigration exceeded immigration flows several times. From 1991 to 1998, the number of people arriving in Latvia from other countries was 39,625 or 4953 people per annum (2%), but the number of people leaving Latvia during that time was 171,777 or 21,472 per annum (8.2%). In the period referred to the net migration was already negative and constituted 132,152 people or 16,519 per annum (-6.2%).

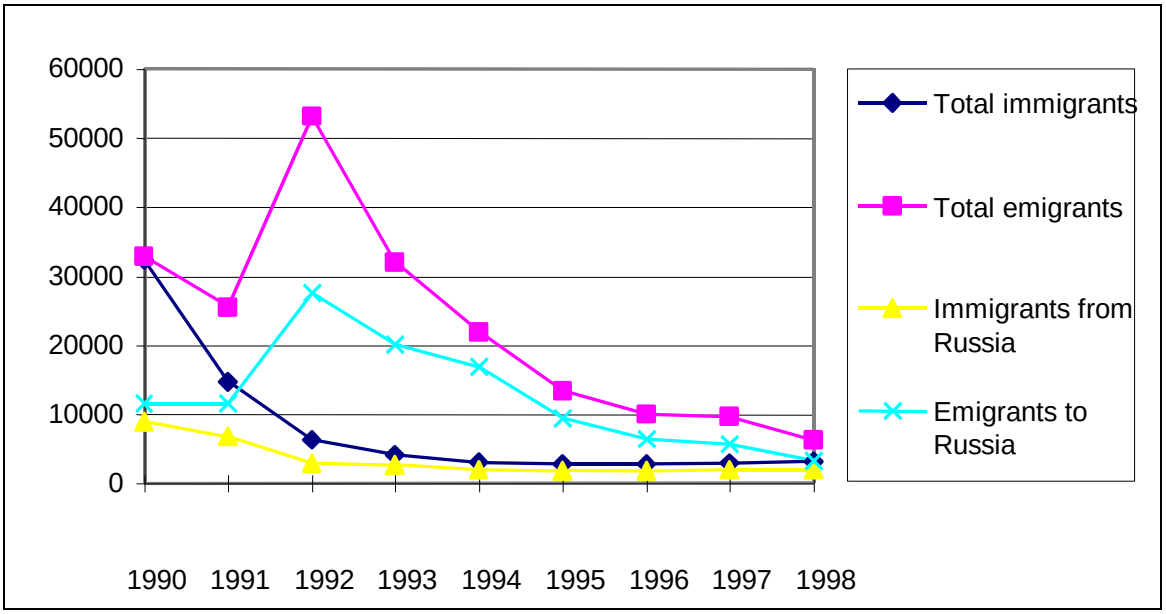

Figure 1. International migration from 1990 to 1998. [CSP/CSBL - Central Statistic Bureau of Latvia].

The change in migration started with a sudden decrease in the number of immigrants. The main reasons were of an economic nature: the loss of a demand for additional labor in industry and the elimination of all privileges in housing for residents of the workers' hostels. The following growth in the number of emigrants was stimulated by political changes: the Law on State Language and the Citizenship Law, under which citizenship is recognized only for those who were citizens before 1940 and their descendants.

In the period under consideration Latvia's population decreased by 8.5%, but 58% of this decrease is accounted for by international migration. The role of international migration in population decrease lessens with each year because the net international migration decreases. If in 1991, 92% of the total population decrease was accounted for by international migration, in 1994 this percentage was 52% and in 1998 it was only 17%. The highest negative balance of international migration was in 1992, when the number of those emigrating exceeded the number of new arrivals by 47,200 people (Table 1).

The losses of resident population by migration are different in urban and rural areas. Because migrants had settled mainly in cities, the number of inhabitants correspondingly diminished in the process. After three to five years of dramatic changes in migration of population in Latvia the number of external re-emigrants has diminished and internal rural-urban exchange has returned to normal.

The major migration flows are connected with Russia. Russians don't immigrate to Latvia, but Latvians residing in Russia do. Emigrating from Latvia to Russia are not only the Russian population but also non-Russians (their numbers being slightly in excess). Not all the residents of other nationalities leaving Latvia return to their ethnic homelands. From 1994 to 1995 a mere 47% of the Ukrainians emigrating from Latvia returned to the Ukraine; the number of Russians leaving Latvia for Russia was 20% higher.

Table 1

Population change in Latvia, 1991 – 1998*

Year	Population change	Of which			
		Natural increase	Natural increase per 1000 population.	Net migration	Net migration per 1000 population
1991	-10912	-116	-0.1	-10796	-4.0
1992	-50782	-3851	-1.5	-46931	-17.7
1993	-40322	-12438	-4.9	-27884	-10.7
1994	-36311	-17501	-6.9	-18810	-7.3
1995	-27883	-17336	-6.9	-10547	-4.2
1996	-21790	-14538	-5.9	-252	-2.9
1997	-21467	-14703	-6.0	-6764	-2.7
1998	-18958	-15790	-6.5	-3168	-1.3

* [CSP/CSBL - Central Statistic Bureau of Latvia].

The mechanical decrease in the population of Latvia occurs in actual fact at the expense of the non-Latvian population.

In 1998 the ethnic composition of the population of Latvia has changed slightly due to international migration. The number of ethnic Latvians increased by 332 persons, while that number of Russians decreased by 2165, Ukrainians by 332, and Belarussians by 336. In the early 1990s the most active emigrants were Ukrainians and Belarussians, but in the middle of the decade it was Russians.

During the last few years comparatively large emigration from Latvia to foreign countries to establish a permanent residence has decreased. In 1992 more than 53,000 people departed from Latvia to settle down in other countries, in 1996 not a full 10,000, but in 1998 about 6300. The decline of emigration presents evidence that living conditions of non-residents are good enough compared to the neighboring countries. The emigration process is expected to cease entirely. The other reason for the decline of migration is the little interest of Russian authorities in receiving the ethnic nationals. The majority of emigrants (70%) left the cities.

Net negative migration, which was first recorded in 1990 (-516 persons) and reached its maximum negative value in 1992 (-46,900), has decreased considerably over the recent years. Net migration with a minus sign was substantially lower in 1998 by comparison with a few previous years; compared with 1997 it was more than two times less.

Over the past five years, the level of immigration into Latvia has been rather stable, with roughly 3000 persons per year.

The list of countries with the most intense emigration flows is practically unchanged – the country of destination for the majority of emigrants was Russia. Less than one-tenth of all emigrants took advantage of the opportunity to emigrate to the West, particularly to Germany, Israel and the USA.

According to statistical data on migration from 1991 to 1998 CIS countries accounted for an average 75% of the overall immigration flow, of which Russia was 73%. Among emigrants in that period the share of CIS countries was 86%, of which Russia was 68% (Table 2).

Over the last years the number of emigrants is rapidly and steadily decreasing. In comparison with 1997, in 1998 emigration declined by 35%, but immigration increased by 7.2%. Migration flows between Latvia and CIS also decreased by 2.3% for immigration and 46.2% for emigration, whereas Western direction emigration flow increased by 9.3%.

A small increase in the level of education among emigrants can also be noted. Over the period of the last eight years the loss of specialists with higher and secondary special education exceeded 50,200 people (48% of all losses).

The age structure of emigrants was more advantageous in comparison with the residents of the country. As a result of international migration from 1991 to 1998 the number of inhabitants of working age decreased by 83,000 (63%). A consequence of emigration is an increased number of persons age 60 and over (24% compared to 16% in 1997).

Table 2

Immigration and emigration flows in Latvia*, 1991 – 1998

	Immigration			Emigration		
	CIS	Other	CIS Percent	CIS	Other	CIS Percent
1991	11994	2690	81.7	21848	3632	85.7
1992	5676	523	91.6	49680	3450	93.5
1993	3529	585	85.8	29234	2764	91.4
1994	2489	557	81.7	19787	2069	90.5
1995	2298	501	82.1	11282	2064	84.5
1996	2274	473	82.8	7908	2091	79.1
1997	2447	466	84.0	7600	2077	78.5
1998	2391	732	76.6	4096	2199	65.0

* [CSP/CSBL - Central Statistic Bureau of Latvia].

Migration to Russia

Latvia and Russia are neighboring countries, tied a variety of links including migration of population. The migration flows have been various by their nature; sometimes they were unfortunately forced and even repressive.

Migration processes in the post-Soviet countries differ considerably from the processes during the Soviet period. The collapse of the USSR and social and economic crises caused new problems and migration features. Researchers from Latvia, Ukraine, Kazakhstan, and the Smolensk Oblast and Altay Kray of Russia are taking part in an international research project, "Socio-Economic and Political Mechanisms of Population Migration in the Republics of the Former Soviet Union." The research is being done with the support of the Open Society Foundation in the framework of the Research Support Scheme. Researchers carried out a survey of potential migrants that determined the significant motives for migration, evaluating several factors that impact on migration. The economical and political situations in Latvia and Russia were compared to determine their potential influence on migration.

Using statistical data for international migration, we did statistical analyses of the socio-economic situation and the dynamics of spatial population distribution in Latvia to confirm the following hypothesis: adoption of more liberal citizenship laws in Latvia, allowing citizenship in Latvia for more "non-indigenous" people, will prevent the migration of a large number of Russian-speaking families. The increasing differentiation of economical development in Latvia and Russia will play the more important role in making the decision of whether to migrate to Russia or not.

From the materials that were collected through this survey, we can draw several conclusions.

First of all, the number of emigrants to Russia is declining from year to year. In 1999, compared to 1998, the number of women who were migrating declined by 7% to a level of 47.1% of all emigrants. The proportion of emigrants who are of working age has remained fairly stable at 55%, but that is a figure that is 11% lower than the indicator among all people who emigrate from Latvia. The elderly represent a larger proportion of emigrants to Russia each year. The share of emigrants who are pensioners (19.1%) is 2.8% higher than is the case among all emigrants from Latvia. People in the 20 to 35 age group emigrate to Russia quite seldom. Indeed, net migration in that age group is favorable to Latvia, while in all other age groups it is negative. That is partly because people of that age have an easier time integrating into the local environment. They speak the local language better than older people do.

The level of education among those who are emigrating to Russia is fairly high: 14.4% have a higher education, 1.5% have an incomplete higher education, 19.7% have a specialized secondary education, and 26.3% have a general secondary education. Comparatively more educated emigrants head for Moscow and St. Petersburg, where highly qualified specialists have

a relatively better opportunity to find jobs. Among the emigrants, a greater proportion of those who have a higher education has gone to Moscow (43.4%) and St. Petersburg (38.3%) than to other parts of Russia. When it comes to the professions of people who leave for Russia, we most commonly find engineers and technicians (16.5%), educational specialists (6.2%) and medical workers (4.5%). Many of them are people who were sent to Latvia to work during Soviet times.

When we look at the national makeup of those who are emigrating, we find that representatives of no fewer than twenty-three different nationalities have left, but the vast majority of them are Russians (75.1%). There are also Latvians (7.9%), Ukrainians (5.9%) and Belarussians (4.2%). In the migration balance with Russia, only ethnic Latvians have a positive balance, while among all other nations it is negative.

The greatest flow of migrants is going to the more developed parts of European Russia, especially those areas which border Latvia. 70% of emigrants settle in cities, where there are much better opportunities to find work, as well as more highly developed social infrastructures. It is not unimportant that 80% of those who have emigrated to Russia lived in cities in Latvia – 60% in the capital city of Riga.

The 1998 economic crisis in Russia had a negative effect on the Latvian economy, and this led to an increase in unemployment, especially in those areas of the economy which were directly related to the Russian market. That serves as a partial explanation for the fact that among those working-age individuals who have emigrated to Russia, 37% have been unemployed.

Internal migration trends

Along with major changes in the volume of international migration, there have also been important changes in the volume and direction of internal migration in Latvia. The total volume of internal migration has declined considerably from a high in 1990. In subsequent years the volume of internal migration has stabilized at approximately 39,000 people per year. The number in 1998 was 32% lower than in 1990.

Table 3

Dynamics of the internal migration*

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Migration extent	54041	49988	45972	37046	39781	39266	39365	39219	38729
Migration intensity (%)	2.0	1.9	1.7	1.4	1.6	1.6	1.6	1.6	1.6
Arrivals: in the cities	28956	26464	22337	19960	23127	23158	23478	23487	22928
Arrivals: in the country	25085	23524	23635	17086	16654	16108	15887	15371	15801
Departures: from the cities	30151	28653	28492	22802	23519	22954	23000	23616	23253
Departures: from the country	23890	21335	17480	14244	16262	16312	16365	15603	15476
Migration balance total	0	0	0	0	0	0	0	0	0
Cities	-1195	-2189	-6155	-2842	-392	204	478	-129	-325
Including Riga	-1315	-1845	-4102	-1737	-1650	-663	-1343	-1263	-1709
Country	1195	2189	6155	2842	392	-204	-478	129	325

* [CSP/CSBL - Central Statistic Bureau of Latvia].

Internal migration in the 1990s has involved the following new trends:

1) If in earlier years people most commonly moved from rural areas to cities, then since 1990 the direction has changed. Migration has led to more arrivals than departures in rural areas, although the positive internal migration balance cannot compensate for population losses that have occurred as the result of natural movement.

2) Between 1990 and 1996 the metropolitan area of Riga did not see an increase in population as the result of internal migration, because more people left the metropolitan region for other parts of Latvia than arrive from other areas. Beginning in 1997, however, the migration balance became positive again, especially in areas that are near the city itself – the Riga and Ogre districts and the city of Jurmala.

3) Since 1990, Riga itself has lost residents each year to internal migration. The most intensive flow of migration has been between Riga and the city's greater metropolitan area. If the number of people arriving from the metropolitan area to Riga proper did not change much at all between 1993 and 1997, then the number of people departing from the city for other parts of the metropolitan area increased. During all of the 1990s Riga had a negative migration balance with the Daugavpils, Kraslava, Ludza and Gulbene districts. Research shows that people who have moved to those districts have taken over denationalized properties. This was particularly common in the early 1990s.

4) The "city-to-city" migration flow has not changed much over time, representing some 30% of the total volume of migration, but the "city-countryside" and "countryside-countryside" flows have declined. The proportion of the "countryside-city" flow in the total structure of migration flow has increased by 5%.

5) In 1993, 55% of all those who arrived in cities came from other cities, but in 1998 the number had declined to 51%. If we analyze those who arrive in rural areas, we see the opposite: 69% in 1993 were former urban residents, while in 1998 their proportion had risen to 74%.

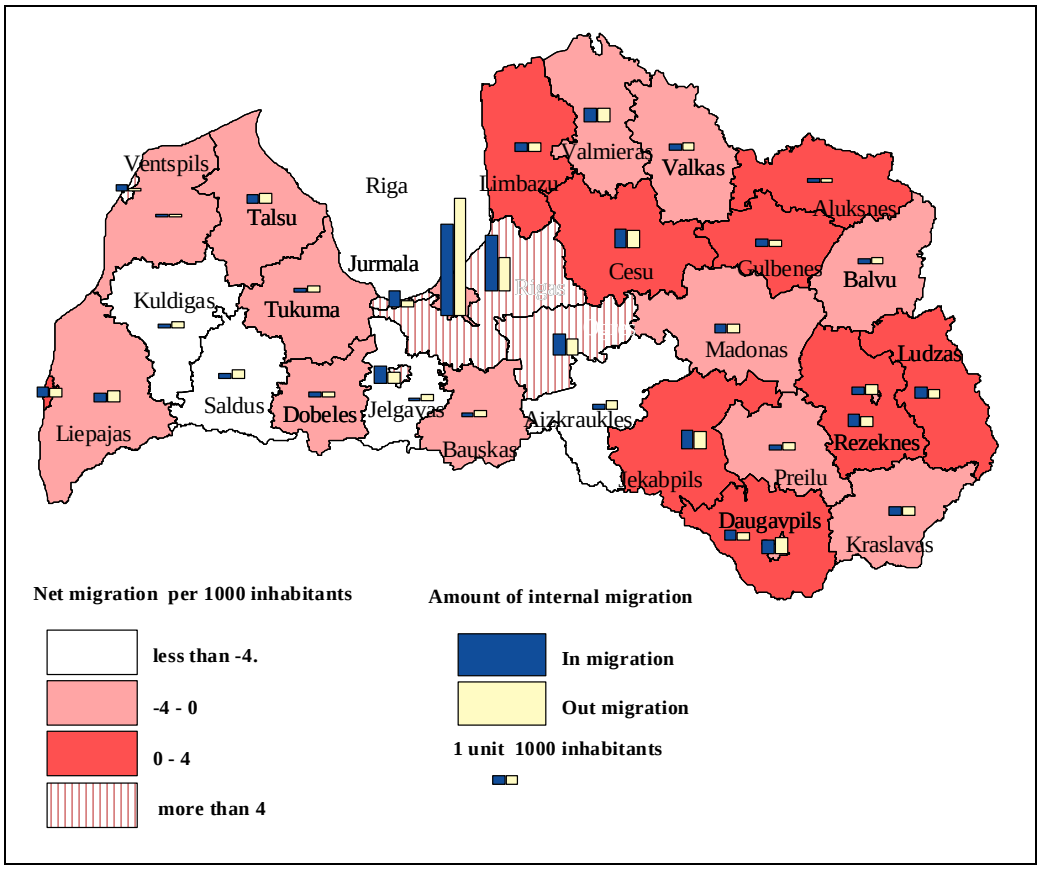

Figure 2. Regional differences of internal migration in Latvia 1997-1999 [Latvia's National Report]

Between 1991 and 1998 the population of Latvia's cities declined by 163,800 people, or an average of 1.1% per year. The pace of population reduction, however, has declined on a yearly basis. 71.2% of the population reduction in Latvia's cities is due to internal and international migration. Over the last eight years, an average of 26,800 people (15.5%) have arrived in Latvia's cities, while 41,300 (23.9%) have departed. The result of internal and international migration has been a loss of an average of 14,600 people each year (-8.4%).

Table 4

Dynamics of internal migration flows*

	1993		1998	
	Amount	%	Amount	%
Total flows	37046	100	38729	100
1.Urban-urban	11068	30	11711	30
Urban-rural	11734	32	11542	30
Rural-urban	8892	24	11217	29
Rural-rural	5352	14	4259	11
2.Arrived in cities	19960	54	22928	59
Arrived in countryside	17086	46	15801	41
3.Departure from cities	22802	62	23253	60
Departure from countryside	14244	38	15476	40

* [CSP/CSBL - Central Statistic Bureau of Latvia].

59% of the people who arrived in Latvia's cities settled in the country's seven national cities – Riga, Daugavpils, Jelgava, Jurmala, Liepaja, Rezekne and Ventspils. 67% of the people who migrated out of Latvia's cities came from those seven cities. The importance of Riga, the capital city, is very great in migration flows – the city receives 30% of the incoming migrants and represents 41% of the outgoing migrants when it comes to Latvia's cities.

Table 5

Structure of migration flows*

	1993		1998	
	Amount	%	Amount	%
Total flows	37046	100	38729	100
2.Arrived in cities	19960	54	22928	59
Arrived in countryside	17086	46	15801	41
3.Departure from cities	22802	62	23253	60
Departure from countryside	14244	38	15476	40

* [CSP/CSBL - Central Statistic Bureau of Latvia].

The role of the country's national cities, including Riga, is even more important when it comes to international migration. Analysis of migration data shows that 78% of all immigrants to Latvia's cities have settled in the national cities, while among all emigrants from cities, 81% comes from the national cities. The share for Riga is 46% and 50% respectively.

International migration cost Latvia's cities 106,200 people between 1991 and 1998: 91% of the overall migration-related population loss in the country. 51% of the international migration losses involve Riga.

Because of internal and international migration, the population of all of Latvia's national cities declined between 1991 and 1998, except for Jurmala, which has seen an increase in the number of permanent residents because of the city's attractive environment and its convenient placement near the capital city of Riga. At the same time, the international migration balance in all of the country's national cities has been negative. In 1999 a positive migration balance was seen in Jurmala, Jelgava and Ventspils.

Migration trends at this time show that suburbs are developing, especially around Riga. Despite the fact that its population has declined in the 1990s, Riga remains a city of intensive economic activity. This belies the generally accepted theory that a positive migration balance is an indicator of economic growth. This phenomenon can be explained through the fact there is

no longer a need for as intensive a concentration of labor as was the case during the over-industrialized Soviet period, because the structure of the national economy has changed greatly. On the other hand, the availability of a wide range of jobs and the development of new and dynamic sectors of the economy create a growing demand for qualified workers, and this could serve to increase migration flows.

Table 6

Total migration in Largest Cities in 1998*

	Number			per 1000 inhabitants		
	Immigration	Emigration	Saldo	Immigration	Emigration	Saldo
Riga	7529	11283	-3754	9.4	14.1	-4.7
Daugavpils	1330	1642	-312	11.5	14.2	-2.7
Jelgava	1665	1352	313	23.5	19.1	4.4
Jurmala	1441	1087	354	24.5	18.4	6.1
Liepaja	1078	1222	-144	11.2	12.7	-1.5
Rezekne	910	1131	-221	22.3	27.7	-5.4
Ventspils	761	630	131	16.3	13.5	2.8
Jekabpils	842	741	101	29.7	26.1	3.6
Ogre	775	618	157	27.9	22.2	5.7
Valmiera	607	584	23	21.2	20.4	0.8

* [CSP/CSBL - Central Statistic Bureau of Latvia].

The 2000 census in Latvia will provide more detailed information about changes in population placement in Latvia. The results of the census 2000 will allow us to judge the durability of migration trends, as well as the extent to which the Population Register actually records domestic mobility in the Latvian population.

Daily commuting

Along with international and domestic migration, Latvia also has a fairly intensive process of daily commuting. Research on this subject were begun in the early 1970s by the Faculty of Geography at the University of Latvia, because at that time Latvia, in comparison to the other Baltic and Soviet republics, had fairly high daily commuting indicators. These indicators increased constantly; in 1991, compared to 1978, the percentage of Latvia's workers who engaged in a daily commute had increased from 11.5% to 13.5% (meaning that they worked in some other town than the one in which they lived). This was particularly true in the central part of Latvia, because many people worked in the capital city of Riga but lived elsewhere. This flow was dictated by historical considerations, but especially by the fact that government, educational, cultural and other institutions and, in particular, industrial facilities were located in and around Riga. Many people wanted to live in Riga, too, but there was a chronic shortage of housing during Soviet times, and so people chose nearby towns and rural centers, where large apartment buildings were often constructed. In 1991, there were 49,150 people who traveled to Riga for work (11.2% of all workers in the city), while 20,700 people (4.6%) traveled from Riga to suburban areas.

Along with economic factors, population mobility is also affected by settlement patterns, the uneven placement of residents and the transportation infrastructure in Latvia. In Latvia, 69% of the population live in cities, and the seventy-seven cities which exist in Latvia are fairly evenly spread around the country. The average distance among them is twenty-six kilometers. There are, however, a few specific considerations when it comes to the settlement pattern in Latvia:

1) There is an excessive concentration of residents in Riga – the metropolitan area is home to nearly one-half of all of the country's residents;

2) Latvia's second city, Daugavpils, is seven times smaller in population than Riga;

3) There is a large number of small cities (those where there are fewer than 5000 people).

The latest data about daily commuting in Latvia were collected in 1991, and information of this kind has not been collected systematically since then. The only way in which new information about daily commuting and the frequency of travel to and from another location could be obtained would be through a survey of residents. Data about the overall mobility of residents and about daily commuting can be used in a wide variety of ways – to describe the everyday movement of residents, but also to specify the areas which are affected by cities.

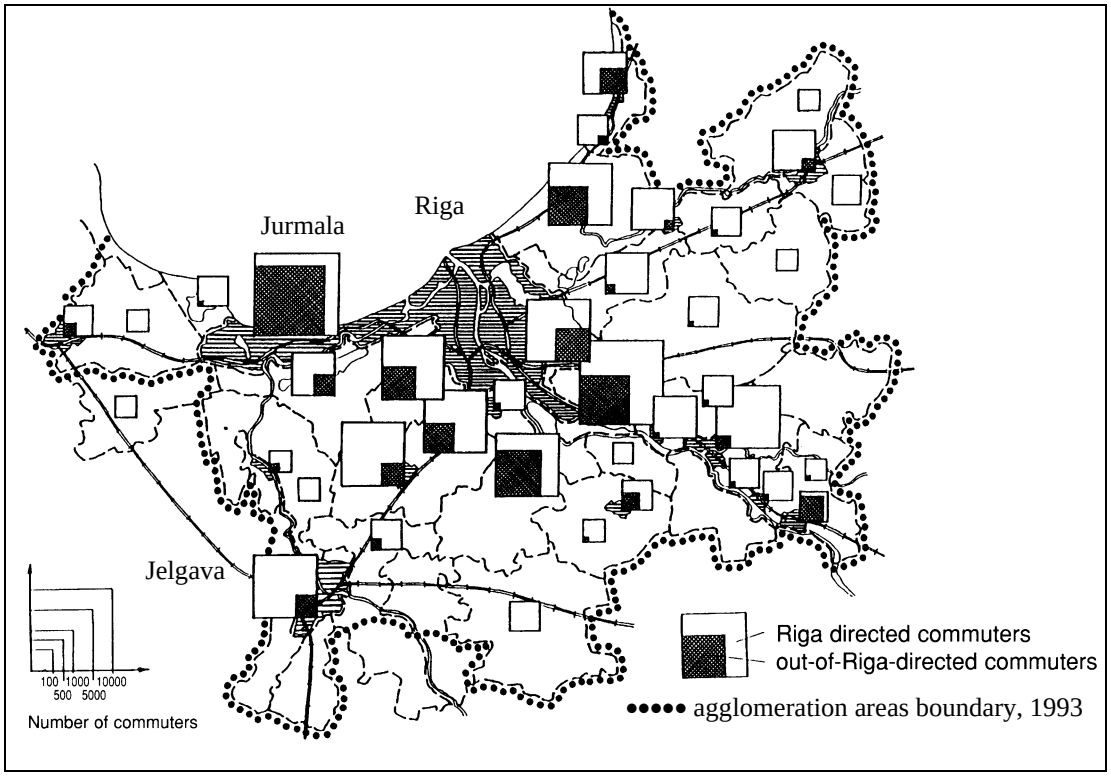

Figure 3. Daily commuting area of Riga in early 1990s.

Today cities do not stop at their administrative borders when it comes to their effect. Reciprocal effect with surrounding territories has an influence on the lifestyle of local residents, on the establishment of adjacent territorial structures and on the development of the cities themselves. Every city has a certain area of effect around itself. This is largely because cities tend to play a centralizing function. The main factors which specify the intensity with which this area of influence emerges include the overall mobility of residents, work and educational migration, as well as industrial contacts.

The area of influence of a city depends not only on the city's population, but also on the spectrum of functions which the city has (in government, the economy, education, culture etc.). Also important are contacts with the surrounding territory. The general mobility of residents is one of the indicators which describes these contacts. Thus, for example, data about daily commuting were one of the most important factors in specifying the borders of the Riga metropolitan area in 1991, as well as in amending those borders in 1996.

When Latvia began to elaborate a national spatial plan in 1999, one of the basic indicators – just as in the research about Riga's metropolitan area – was information about the general mobility of residents, and the volume of daily commuting for work purposes was also considered. These indicators are not as concentrated, because the areas of influence of large cities do not tend to have very large population and settlement density.

When it comes to the placement of residents and types of settlement, the areas of influence of the cities of Ventspils, Liepaja, Daugavpils, Rezekne, Jekabpils, Valmiera and Jelgava can be divided into three parts:

1) The cities themselves as the centers for these areas of influence;

2) Adjacent areas, part of which are urban areas (this is a territory which has definitive links with the city);

3) Areas of weak influence.

The secondary areas of influence do not have characteristics that are as specific as those in areas which are influenced most directly, but they do differ in terms of living conditions, industrial conditions and rural environments. People who live closer to large cities have better and more varied opportunities to find work, educational opportunities and recreational opportunities. That is because cities offer broader varieties of economic activities, as well as various services that are only possible in large cities. On the basis of their large area of influence, moreover, cities can expand their potential – improve their functional content and offer new opportunities for investment. Urban areas which are part of the regions of influence can be used as statistical data units, as is the case in a number of other countries, including Finland, already.

If we are to take a comparative look at the changes which have occurred in population mobility in the 1990s, we can compare volumes of daily migration and the proportions which this process represents in the labor force in the seven largest urban areas in Latvia. These are territories which underwent special study in 1999.

Table 7

Dynamic of daily commuting in larger cities

Cities	Number of inhabitants in city 1999	Number of daily commuting to work	Daily commuting to work in % of employed persons in city	Number of daily commuting to work	Daily commuting to work in % of employed persons in city
		1991		1999	
Daugavpils	115450	3161	5.3	2997	5.1
Jekabpils	28384	1490	9.9	1238	12.4
Jelgava	70931	3113	9.0	2509	7.5
Liepaja	95427	1498	3.3	2295	5.1
Rezekne	40557	2302	9.8	1718	8.1
Valmiera	28593	2625	15.3	1967	14.0
Ventspils	46501	626	3.1	1279	5.4

Data which are shown in Table 7 with reference to population mobility allow us to conclude that there are now several new trends in this area:

1) In comparison to the late 1980s and early 1990s, there has been a very significant decline in the flow of daily commuting from the centers of urban areas to peripheral areas, because suburban job opportunities have in many cases disappeared. Major farms that used to be near cities have collapsed, and many of the people who worked in the kolhozes – especially scientific specialists – lived in the cities.

2) The decline in daily commuting within cities has been influenced by the fact that many Soviet-era industrial factories shut down or reduced their output. One example was the closure of a factory in Jelgava which produced vans.

3) The intensity of daily commuting from suburban areas to the centers of cities today depends on the level of development in cities and on their ability to adapt to the demands of the market economy. The volume of daily commuting to Ventspils has nearly doubled, because that city is home to a very successful port.

4) Job losses in rural areas have led people to go to work in cities.

Additional data about population mobility in the Riga metropolitan area have led to the conclusion that the process has very much been affected by socioeconomic change in Latvia. There have been more rapid economic transformation processes in Riga and its environs than in other parts of Latvia. New and dynamic sectors of the economy are emerging, and this is

evidenced by the fact that 60% of the country's foreign investment has gone to the Riga area. There has been a rapid increase in the demand for highly qualified workers and specialists, and the fact that they have been found is proven by the increase in the flow of daily commuting. At the same time, however, there is something else which is affecting changes in the lifestyle of a specific group in the population. The suburbanization processes which are common in Western countries are also beginning to appear in Latvia. Small villages of private homes are popping up on Riga's peripheries, and some people are building individual homes in the beautiful areas around the city.

Population mobility also has much to do with transportation infrastructures. Today in Latvia there are many more people who use their own cars to go to work or to run errands than was the case in Soviet times, but public transportation is still of great importance in Latvia. When territorial development is considered, accessibility must be a key issue.

Conclusions

Political, social and economic changes in the early 1990s in Latvia meant a fundamental shift in the volume and direction of international migration, and Latvia, which during Soviet times was an immigration-dominated republic, became an emigration-dominated country.

If we analyze these migration processes, we see that there was stabilization in the processes beginning in 1995. This means that Latvia needed only five years before the number of immigrants stabilized to approximately 3000 people each year. Stabilization of the number of emigrants to some 5000 people a year, by contrast, took nearly ten years. This has to do with the stabilization of Latvia's economic situation and the public integration policies which the Latvian government has been implementing.

Russia continues to dominate in international migration flows in Latvia, but its proportions and volumes are declining slowly in favor of Western flows. Internal migration flows have declined by one-third since 1990 to a stable level of 1.6% of the total population each year over the last several years. Internal migration trends in the early 1990s, which saw flows of people from cities to rural areas and from the central part of the country to its peripheries, turned out to be only temporary.

Beginning in 1998, the system began to return to the trend of the 1970s and 1980s – the flow from rural areas to cities and from peripheral areas to the Riga metropolitan area is once again dominant in the migration system. At the same time, it must be said that even though the capital city has the country's best economic development indicators, the highest level of investment and the lowest unemployment rate, it has lost people through internal migration every year since 1990.

Although proximity to Riga is generally seen as a promoting factor in small-town development, it must be noted that in recent years we have seen increasing numbers of people from the area around Riga coming to work in the capital city. Riga offers better opportunities to find work, more various places of employment, and higher salaries on average. On the other hand, the cost of living in Riga is higher than in small towns; both housing prices and rental costs tend to be higher. These conditions, as well as the labor market, influence the intensity of daily commuting in the metropolitan area of Riga. It is also true that many people from Riga's industrial suburbs now work in the city proper, because the suburbs were built around Soviet-era industrial facilities that were so narrowly specialized that they lost their markets and can no longer provide work. When these suburban residents come to work in Riga, they take advantage of the service and retail facilities of the city. This means that such establishments are not being set up in small towns, because goods and services can be found in Riga in a much greater variety.

The other significant factor for population mobility is the accessibility to major transportation routes and hubs from home.

There are several new features in comparison with the end of the eighties: distance for daily commuting to Riga has became longer (many more employees now come from outside the immediate metropolitan area); many employees stay in Riga and other cities during the week; the number of rural inhabitants working in the cities has increased.

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The Dynamics of Latvia's Urban and Rural Population At the End of the 20th Century

Pārsla Eglīte

Annotation

This research project focuses on trends in Latvia's population numbers and related factors as the country has moved toward a market economy between 1991 and 1999. The author looks at the intensity of population reproduction and differences therein in various parts of the country. The work also evaluates the way in which reproduction in cities and rural areas is affecting future population growth and distribution in Latvia. The author has relied on an analysis of demographic statistics for conclusions.

Introduction

Latvia is a small country – only 2,424,000 people at the beginning of 2000. Population numbers have been declining because of emigration and because of a decrease in natural growth Both processes are rooted in the way in which the Latvian population has been formed over the last half century.

After Latvia was annexed forcibly by the Soviet Union on the basis of the infamous Molotov-Ribbentrop pact between Stalin and Hitler, the country suffered enormous population losses. During the first year of Soviet rule, more than 30,000 people were killed or deported. During the subsequent years of Nazi occupation, another 100,000 people died. Military pursuits involved some 180,000 men on both sides of the war, and many were killed. Between 1944 and 1945, some 200,000 people fled to the West, and in the five years after the war, through 1949, another 100,000 were deported by the Soviet authorities to Siberia. Latvia's net loss in population as a result of the war and the early years of the occupation amounted to some 30%. It is doubtful that any other population, except for the Jews, has suffered such enormous population losses as a consequence of World War II.

Those who survived exile in Siberia began to return to Latvia only after 1956. In the meantime, thousands upon thousands of migrants from other Soviet republics flooded into Latvia, especially from Russia. Latvia was among the most developed areas of the Soviet Union, and massive migration did not stop until the late 1980s. During the last two decades of the occupation, net migration in Latvia exceeded natural population growth – almost twofold in the 1970s.

The total number of post-war migrants and their descendants reached nearly one million before the Soviet period ended in 1989 – the equivalent of 36.3% of the country's population (and the count does not include non-Latvians who were residents of Latvia before the war). The native Latvians did not restore their pre-war population numbers. In 1989 the number of Latvians in the country was 94.5% of the number in 1935, while among Jews the figure was just 24.5%.

The unusual proportion between these two sources of population growth – the natural increase and migration – led to dramatic changes in Latvia's ethnic composition. The share of the native population decreased from 77% at the end of the pre-war period to 52% in 1989, while the share of Russians increased from 9% to 34%. Ukrainians increased their share from 0.1% to 3.4%. This made it relatively easy for Moscow to carry out a policy of Russification in Latvia that was hidden under the slogan of the "united Soviet nation". Natives could not use their own language in government offices and in most places of employment, while Russians had no need to learn the local language or to integrate into the societies in which they had settled. Even in the mid-1990s, fewer than one-half of the Russians in Latvia spoke the Latvian language.

The situation has changed drastically, however, since the collapse of the Soviet Union.

Changes in population numbers

All countries which are undergoing a post-Socialist crisis and are engaged in a process of economic transition at this time have suffered lowered fertility rates and a decline in average life spans. In most Eastern and Central European countries, natural population growth has been replaced by population losses. The problem is made all the worse in Latvia by the fact that the population is rapidly aging. What's more, a number of migrants who arrived during the Soviet occupation have departed – Latvia's population has decreased by 8.6% since 1991 (here and elsewhere data are from the Latvian Demographic Yearbook, unless cited otherwise). Among countries in the former Socialist bloc, only Russia has an equally low fertility rate, and an even lower average life span [CSP/CSBL 1999; Naseļeņije (No. 20) 1997; Population 1997]. In Russia, unlike in Latvia, losses caused by declining population reproduction have been made up to a considerable extent by migration. Soviet-era migrants and their descendants are returning from other former Soviet republics [Naseļeņije Rossii 1997:145].

In the 1990s in Latvia, nearly 45% of total population losses have been caused by the fact that death rates have exceeded birth rates – 30.2% in the first half of the 1990s and 75.5% in the latter half of the decade – while the rest of the loss has been caused by net migration.

The greatest losses have occurred in the country's cities, and urban areas now represent a slightly lower share of the overall population than was true ten years ago (Table 1). Because most of the migrants who arrived during the Soviet period settled in cities, shifts in migration patterns since the early 1990s have been of greater significance in urban areas than in rural areas. At the same time, however, the importance of the process has not been directly proportional to the size of the various cities and towns in Latvia. In Latvia's only really large city – the capital city of Riga – there has been the greatest number of people who have left as a result of migration, but the share of losses caused by migration has been lower than the urban average in Latvia, because the fertility rate which is of decisive importance in natural growth has remained particularly low in the city.

Table 1

Population change components in Latvia*

Year	Resident population, thsd on 1st Jan.	Population change per 1000 popul.		Share of natural increase, %[2]				Distribution of population, %		
		natural[1]	net migration[1]	whole country	of which: cities and towns	of which: capital Riga	of which: rural areas	all towns and cities	capital Riga (over 800 thsd)	6 large cities (over 40 thsd)
1991	2667.9	-0.1	-4.0	0.9	2.7	17.5	0.0[3]	69.2	33.9	17.7
1992	2656.9	-1.5	-17.7	7.7	7.3	31.3	10.2	70.4	33.8	17.6
1993	2606.2	-4.9	-10.7	30.9	27.0	34.0	53.3	68.7	33.5	17.6
1994	2565.8	-6.9	-7.3	48.2	43.8	44.1	65.8	70.2	33.4	17.4
1995	2529.5	-6.9	-4.2	62.2	57.3	52.5	77.6	69.1	33.2	17.4
1996	2501.7	-5.9	-2.9	66.5	61.9	50.3	79.3	69.0	33.0	17.4
1997	2479.9	-6.0	-2.7	68.4	66.7	55.3	72.4	69.1	32.9	17.4
1998	2458.4	-6.4	-1.3	83.1	75.8	59.5	105.1	69.1	32.8	17.5
1999	2439.4	-5.5	-0.8	87.3	..	..	..	69.0	32.7	17.5
2000	2424.3	..	..	..	..	..	..	..	..	..
1999: 1991, %	91.4	..	..	..	..	..	..	99.7	96.4	98.9

* Demographic Yearbook of Latvia – according years

[1]- more detailed data in tables 2 and 4

[2]- without administrative changes

[3]- natural increase balanced by migration

The fertility rate

Since World War II, the largest number of new-borns in Latvia was recorded in 1987, when 42,100 children were born. Since then the number of births has dropped by more than one-half, to just 19,500 children in 1999. This has partly happened because more than 135,000 people have moved away from Latvia. If we compare indicators relevant to birth rate intensity which are not affected by changes in population and in age composition, the reduction turns out to be a bit lower. Since 1987 the total fertility rate (meaning the number of children born to each woman during the course of her life) and the net reproduction rate which addresses the level of generation reproduction have declined by 1.85 times, or by 46%. It was precisely in the early 1990s, when the country's independence had just been restored, that the total fertility rate declined by 38% and the net reproduction rate dropped by 37%. The net fertility rate in 1998 in Latvia had dropped to 1.09 – the lowest rate in all of Europe except for Bulgaria. Their net reproduction rate was at a level of 0.52 – a rate which is not found anywhere else.

The number of live births in Latvia, as well as the overall fertility rate in the country, increased a bit in 1999. This is possibly in part because childcare allowance payments were increased in mid-1998, and there was a higher family allowance for new-borns after January 1, 1999. It is too early to say, however, that this trend will be a lasting one, because there is no guarantee that government support payments to families will be increased each year even to meet the inflation rate.

Fertility indicators in cities, and especially in Riga, have traditionally been lower than in rural areas, and the declines have been more distinct than in the countryside (Table 2). As a consequence of this, fertility rate differences in various parts of the country have increased, and this has happened as the likelihood of a second child in the family has declined – from 59.7% to 51.0% in cities (i.e., by 14.6%), and from 78.3% to 72.4% (7.5%) in rural areas. The likelihood of a third child has declined a bit more rapidly in rural areas than in cities, but the likelihood is still higher – 34.1% in rural areas and 14.3% in cities in 1998. One-child families are more common in cities, and two-child families prevail in rural areas. Accordingly, the lowest fertility rate is found in the country's cities (Figure 1).

Table 2

Replacement Level of Urban and Rural Population in Latvia*

Year	Total fertility rate			Net reproductive rate			Natural increase/losses		
	urban	rural	Riga	urban	rural	Riga	urban	rural	Riga
1991	1.65	2.42	1.46	0.785	1.137	0.686	-0.2	+0.3	-1.7
1992	1.50	2.30	1.30	0.711	1.081	0.619	-1.9	-0.7	-3.5
1993	1.27	2.06	1.08	0.609	0.983	0.521	-5.2	-3.9	-7.0
1994	1.19	1.86	1.04	0.569	0.875	0.488	-7.2	-6.1	-8.6
1995	1.09	1.64	0.98	0.509	0.743	0.455	-7.0	-6.7	-8.3
1996	1.00	1.56	0.90	0.467	0.733	0.429	-5.8	-5.9	-6.5
1997	0.97	1.46	0.86	0.448	0.691	0.390	-5.8	-6.3	-6.7
1998	0.95	1.46	0.86	0.448	0.696	0.402	-6.3	-6.7	-6.9
1998: 1991, %	39.4	60.3	58.9	57.1	61.2	58.6	..	..	..

* Demographic Yearbook of Latvia 1998. Riga: CSP. 1999: 58; 80.

Given the overall share of the national population which rural residents represent, the urban family model does not satisfy population reproduction needs. Research of the reasons why fertility rates remain low is a key issue for demographic research. Studies most often point to unfavorable material circumstances [Eglīte 1995; Zariņa 1995:53; Zvidriņš (ed.) 1996:42]. If we look at per capita household income in urban and rural areas, we see that the material welfare of city dwellers is higher – Ls 67.3 and Ls 51.4 per household member respectively in 1998 [CSP/CSBL 1999a:8]. Urban residents achieve this difference precisely because they have fewer children – the number of dependants per wage earner is lower in cities. Despite lower per capita income, however, a fairly significant portion of rural residents rate their level of welfare as good or average (61.0%, as opposed to just 49.4% of residents in cities). 39.0% of rural

residents and 50.6% of city dwellers (including 49.6% of Rigensians) expressed dissatisfaction with their material status [CSP/CSBL 1999a:156]. The seeming incompatibility between these subjective evaluations of welfare and the income levels that have been calculated can be explained by noting that children consume less than adults do, at least before they start going to school, and there are also different expenditure structures in various parts of the country. In cities people need more money for rent and heat (10.8% of total expenditures in rural areas as opposed to 19.1% in cities) and for other specifics of urban life. It is entirely possible that there are also different desires and evaluation criteria which affect human behavior with respect to having more children.

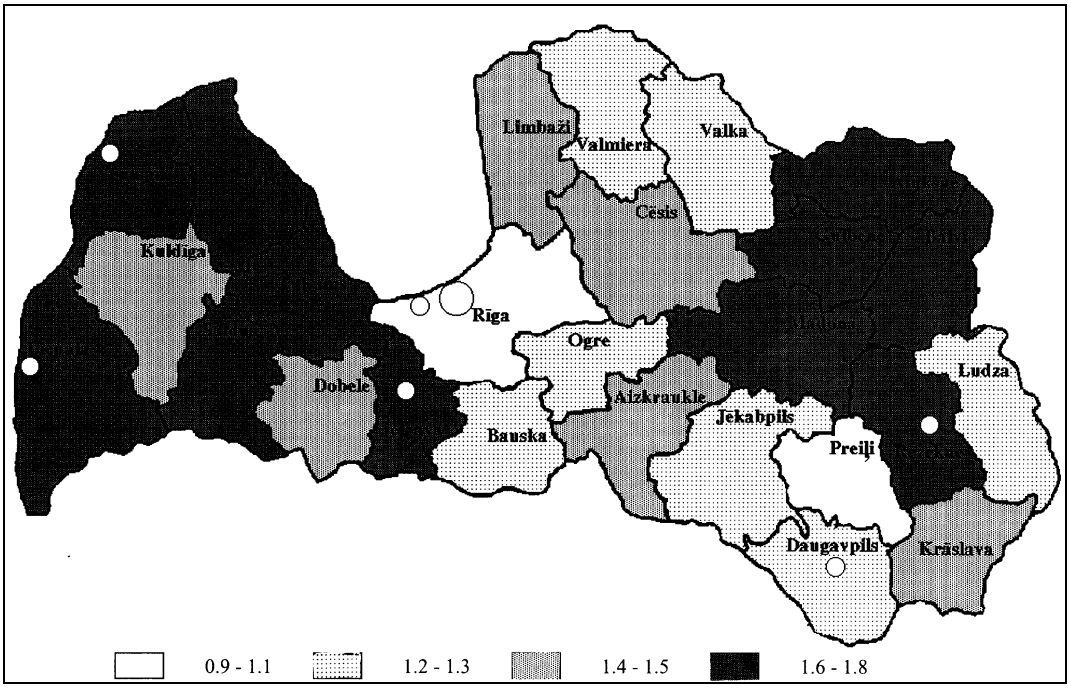

Figure 1. Total fertility rate in Latvia by districts, 1996.

Another very important reason for the excessive presence of one-child families in urban areas is the constitution of the population in terms of ethnic groups. In the last census that was taken in Latvia (in 1989), it was found that the average number of children born to each Latvian woman, both in rural and urban areas, was above the average. The total fertility rate in urban areas was, respectively, 1.98 and 1.83, while in the countryside it was 2.73 and 2.68. After the independence of the state was restored, the differences increased even more. The proportion of children born to Latvian women has increased more rapidly than has the proportion of the Latvians among all residents in Latvia (the total fertility rate can be calculated with respect to ethnic groups only on the basis of data from a census). The proportion of Latvians in the total population increased from 52.0% to 55.7% between 1991 and 1998, while the proportion of Latvians among new-bores increased from 58% to 62.8% (the maximum being reached in 1994, when the share was 64.8%).

The proportion of children born to Latvian women exceeds the proportion of Latvians in all areas of the country – 47.1% versus 38.8% in Riga, 43.8% against 38.1% in the other six larger cities in Latvia, and 76.6% versus 72.7% in rural areas.

Thanks to a higher fertility rate and to a higher proportion of natives in the overall population in rural areas, 38.5% of all children and nearly one-half of Latvian children (46.8% in 1998) are born in rural areas. Riga, taking into account the city's ethnic constitution (38.8% of the capital's residents in 1998 were Latvians), was the place of birth for 26.5% of all children but only 19.9% of children born to Latvian women. In the other six cities the numbers were 16.0% and 11.2%. This demonstrates how very important it is to ensure the availability of schools and proper instructional quality in rural schools, thus encouraging children to remain in

their families longer in rural areas and discouraging parents from feeling that they must necessarily move to cities.

The concentration of educational institutions in Latvia in major urban centers is one of the main reasons why the proportion of people who are of child-bearing age is on the rise in urban areas and declining in rural areas, especially in the more peripheral regions of the country (Figure 2). The concentration of people who are of working age in specific territories is greater than the concentration of all residents. At the beginning of 1999, the numbers were 33.7% and 32.7% in Riga, 18.2% and 17.5% in other cities, and 70.9% and 69.0% in all cities taken together. People of fertile or reproductive age have been moving to areas where the fertility rate is lower, and this inevitably leads to a smaller number of new-bores – something that is by no means favorable for Latvia's future (compare the two figures).

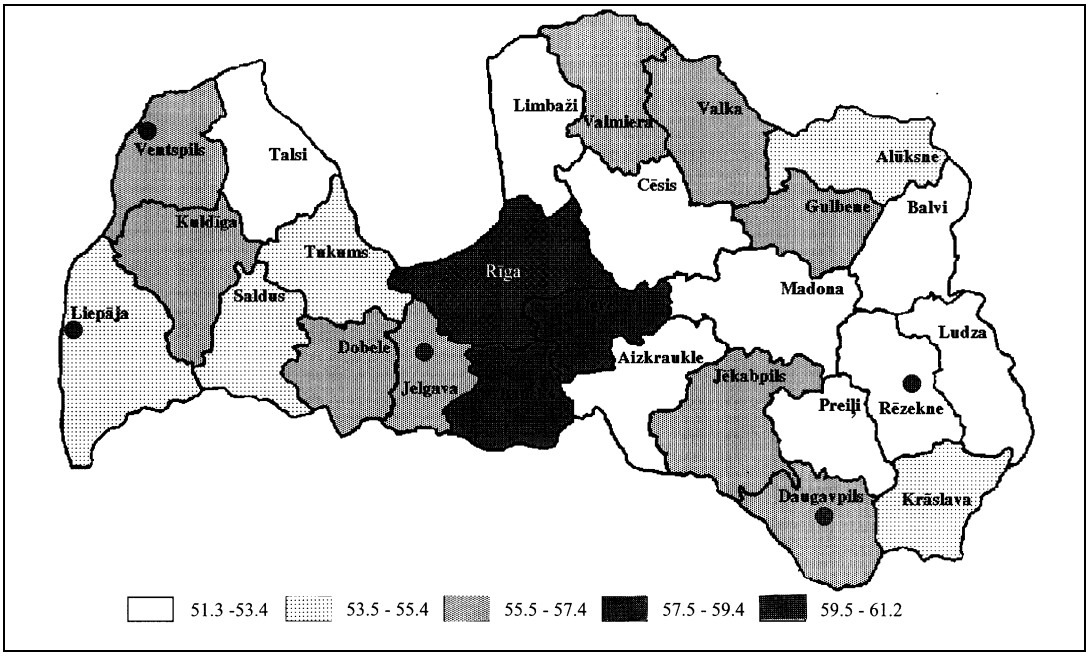

Figure 2. The share of working age population in Latvia by districts, 1996, %.

An excessive narrowing of the reproduction of generations in Latvia's cities, moreover, means that population numbers and the labor force in urban areas are not being regenerated either. The concentration of new jobs in the capital city and other major cities has led to higher employment levels in those areas than in rural areas, and this too serves to draw young people away from the countryside. This has been happening for centuries, but today, when the fertility rate in rural areas does not ensure reproduction of generations, it means that some rural areas may die out altogether. For that reason, it is particularly important to avert any further concentration of the population, to ensure that people can have larger families in cities, and to work toward expanding life expectancy in the country to compensate for the lower fertility rate.

Vitality

A basic indicator of the vitality of a nation – one which is used in international comparisons to rate the health and quality of life of populations – is the average expected life span of new-bores. Today Latvia is far behind the more developed countries of Europe in this regard. In 1996, the European average was 74.0 years for men and 80.5 years for women [Population 1997], while in Latvia the figures were 64.1 and 75.5 years (1998) respectively. The difference in the life span of people of the two genders, moreover, was two times larger.

It turns out that the average life span of people, unlike the fertility rate, is higher for urban residents of both genders than it is for people in the countryside, and the difference is greater for men than for women – by three years, or 4.8% for men, and by one year, or 1.3% for women (Table 3). This means that at the end of the 20th century, women in Latvia's cities were expected

to live 10.7 years longer, on average, than men, while in rural areas women were expected to live 12.7 year longer than men – i.e., the difference in average life spans in rural areas is greater.

Table 3

Vitality of Urban and Rural Population in Latvia*

Year	Average life expectancy at birth				Infant mortality		
	males		females		urban	rural	Riga
	urban	rural	urban	rural			
1991	65.05	62.12	75.12	73.12	15.4	15.8	15.5
1992	63.87	60.95	74.95	74.12	16.2	19.3	16.0
1993	60.23	59.82	74.17	73.20	15.7	16.2	13.9
1994	60.15	59.51	73.35	72.85	16.6	13.8	15.2
1995	60.99	59.57	73.82	72.74	18.0	19.4	20.7
1996	64.25	61.45	75.97	74.93	14.7	17.4	14.6
1997	65.21	62.85	76.05	75.36	15.5	14.8	15.5
1998	65.17	62.16	75.88	74.87	13.8	16.8	13.3
1998: 1991, %	100.2	100.1	101.0	102.4	89.6	106.3	85.8

* Demographic Yearbook of Latvia 1998. Riga: CSP. 1999: 58; 113.

As we know, average life span figures are impacted most distinctly by the incidence of premature deaths, and the younger the people who die, the greater the effect. Infant mortality is a particularly important indicator in this regard. In nearly all of the last several years, infant mortality has been more prevalent in rural areas than in urban areas, and this, of course, has been one of the reasons why average life spans in the countryside are shorter.

Infant mortality rates are affected by environmental factors, by the health of parents, and by the availability of medical treatments. The latter factor may, in fact, be the determinant factor in the increased level of infant mortality and shorter life spans in Latvia's rural areas. These are conditions which are of equal importance for people of both genders, so they cannot be responsible for the fact that women live longer than men in rural areas to an even greater extent than is the case in cities.

Men die of external causes of death 3.5 times more frequently than women in Latvia, and this happens, on average, at an earlier point in life than does death from malignant tumors or (especially) diseases of the circulatory system. External causes such as traffic accidents, suicide, murder, etc., were the cause of death for men in rural areas in 1998 25% more often than for men in cities, and rural men died of such causes four times more frequently than did rural women (the difference in cities was 3.2 times). Deaths from external causes most often involve the behavior of the person who has died – either carelessness or harmful habits. To a certain extent this has to do with differences in employment structures in cities and rural areas, as well as with limited opportunities for work and healthy leisure time activities in these regions.

In cities, and especially in Riga, death from malignant tumors is relatively more common among residents of both genders. In 1998 such deaths in rural areas represented 16.0% of all deaths among men and 12.3% of deaths among women, while in cities the figures were 18.3% and 17.6% respectively (18.5% and 19.3% in Riga). This is to some extent related to the greater proportion of people of working age in cities, because death from malignant tumors occurs among people of working age more commonly than do causes that are usually associated with the elderly – problems with circulatory systems in particular. If we compare the structure and intensity of mortality in Riga and other cities in Latvia among people of the same age and of more or less the same overall death rate per 100,000 people, we find that the incidence of malignant tumors in Riga is higher [Eglīte et al. 1997b:42]. One of the relevant causes may be greater environmental pollution and relatively unhealthy lifestyles in the large metropolitan area that is Riga. The incidence of tumors in women may also be affected by the excessive limitation on the number of children that women have – something that is most prevalent in Riga.

We can conclude that despite the fact that the average expected life span of people in cities is slightly higher than in the countryside, an excessive concentration of people in cities would not be desirable from the health perspective.

Migration

The migration rate in Latvia in both directions was most intensive in the first few years after the country restored its independence. If during the Soviet occupation Latvia's population increased constantly because of immigration from other republics of the Soviet Union, then in the post-independence period population numbers began to decline as former immigrants and their descendants began to return to their countries of origin. Ukrainians and Belarussians emigrated most intensively in the early 1990s, and Russians emigrated in the largest numbers in the mid-1990s. Of those who departed, a bit less than one-tenth went to the West – especially to Germany, Israel and the United States.

The largest number of emigrants – 47,200 people – departed from Latvia in 1992, when the country's independence was secure and when there was not yet much clarity about the attitude that the new country would take toward Soviet-era immigrants of other nationalities. The number of departures in subsequent years declined steadily and rapidly (Table 4). This suggests that non-Latvians enjoy a relatively good life in Latvia, at least when compared to the situation in neighboring countries, and this objectively refutes claims from Moscow that the human rights of Russians in Latvia are being violated. We can expect that the process of migration will stop all but completely soon. A second reason for the reduced incidence of migration is the fact that Russia's government has little interest in absorbing new arrivals from the various peripheries of the former USSR, because there are great difficulties in securing housing and jobs in the Russian Federation's cities [Eglīte 1997:202].

Table 4

Migration in Latvia, thsd*

Year	External		Internal	Net migration				
				whole country	urban areas		rural areas	
	immi-grants	emigrants			exter-nal	inter-nal	exter-nal	inter-nal
1991	12.6	23.8	52.0	-11.2	-8.5	-1.8	-2.6	2.1**
1992	4.6	51.8	47.6	-47.2	-35.7	-5.9	-11.5	6.2**
1993	3.1	31.3	38.1	-28.2	-22.4	-2.6	-5.7	2.9**
1994	3.1	21.9	39.8	-18.8	-15.9	-0.4	-2.9	0.4
1995	2.8	13.4	39.3	-10.6	-9.2	0.2	-1.3	-0.2
1996	2.8	10.0	39.3	-7.2	-6.6	0.5	-0.7	-0.5
1997	2.9	9.7	39.2	-6.8	-4.8	-0.1	-2.0	0.1
1998	3.1	6.3	38.7	-3.2	-3.1	-0.3	-0.1	0.3
1999	1.8	3.6	..	-1.8	..	..	..	..
1998: 1991, %	24.6	26.5	74.4	28.6	36.5	16.7	38.5	14.3
1998: 1992, %	67.4	12.2	81.3	6.8	8.7	5.1	0.9	4.8

* Demographic Yearbook of Latvia
** including army and ex-prisoners

As the number of people who emigrate from Latvia has declined, so has the importance of this factor in overall population decline in the country and its various regions (Table 1). Most of those who departed came from Latvia's cities (70%), and at one time this was the determinant factor in population declines in urban areas, as well as in the decreasing proportion of urban residents in the total population. Of those who left the cities, 90% moved out of Latvia altogether, while the remaining moved to rural areas within the country, usually because of the denationalization of land [Eglīte et al. 1997a:20-22]. The number of people who moved from cities to rural areas, however, was equal to only one-third of the number of people who departed from the countryside as the result of external migration.

In the mid-1990s, when compared to the beginning of the decade, there were changes both in the intensity and in the directions of migration. As the incidence of external migration receded, the process of internal migration regained its usual direction – from rural areas to cities. As fertility rates in rural areas remain too low to ensure population increases, migration to cities may lead to an increasing aging of rural populations. Some areas may die out altogether, and the number of people who move to cities will decline accordingly. From this perspective it is not all that bad that the trend towards urbanization is weak and not particularly durable.

Expected changes in the numbers and distribution of Latvia's population

In the interest of evaluating the consequences of the various things that are happening in Latvia's population at this time, the Institute of Economics Latvian Academy of Sciences elaborated a forecast based on the assumption that there will be inertia in these processes, i.e., that the fertility and mortality rate in various age groups in Latvia will remain unchanged for rural and urban residents alike over the next twenty years, and that some rural residents, provided that the number of such residents increases, will move to the cities. Taking into account the fact that emigration from Latvia has slowed down over the last six years, we have not calculated any changes caused by migration in our study [Eglīte et al. 1999:63-73]. We feel that this assumption is justified because various surveys conducted by different organizations have all found that the proportion of Latvia's residents who hope to emigrate someday has declined steadily since the early 1990s [Eglīte 1997:206-207].

If the number of children in Latvia's families remains low, it can be expected that the overall number of residents, as well as (especially) the proportion of young people in the population, will decline very rapidly (Table 5). Government officials are already using this fact to argue for a greater concentration of schoolchildren in larger educational institutions. This would mean the loss of jobs for teachers, however, and a concentration of members of the intelligentsia in increasingly few places in the country. This would exacerbate differences in living conditions and the quality of life between Latvia's urban areas and rural areas. This is the main reason for internal migration in Latvia, and it should not be encouraged. Because the fertility rate among urban residents in various age groups is lower than among rural residents, we can expect that in the early part of the 21st century the proportion of urban residents in Latvia's population will decline, and the population in urban areas will age more quickly than in the countryside.

If urban pollution and the incidence of malignant tumors in urban residents that are caused by lifestyle factors continue to increase, it would be a good thing if the proportion of Latvia's residents who live in cities were to decline. At the same time, there must be greater government support to families so as to ensure that the age distribution of urban residents is improved and that population reproduction once again becomes possible in the future.

It is expected that population losses in rural areas over the next twenty years will be less, and the aging of the population will be less pronounced. In some of the country's more peripheral regions, however, depopulation has been such a great problem that there are parts that may very well die out completely. The same future can be expected by Latvia as a whole if the government does not change its thinking about the need to provide for population reproduction. First and foremost there must be greater employment opportunities throughout the country, especially in more peripheral regions, because it represents the main source of income for people.

Even if the country's social policies were completely favorable, however, this would not reverse the consequences of the enormous decline in the fertility rate in Latvia in the early 1990s. The number of women of child-bearing age in the 2020s, especially in urban areas, will be as much as one-third lower than was the case at the end of the 20th century, and this, of course, will mean an even lower birth rate.

The aging of the population is also inevitable. The proportion represented by the youngest generation – the generation which learns the very latest knowledge and studies the most modern professions – will decline. The average educational level and the availability of human capital, therefore, will increase more slowly than would otherwise be the case. Latvia's competitiveness in the European and world environment will suffer.

Table 5

Projected changes of the Latvian population and main age groups, %*

Age groups	1999	Project (constant scenario)				2019: 1999, %
		2004	2009	2014	2019	
Urban, thous	1683.6	1622.9	1560.4	1487.8	1403.1	83.3
of which %						
0-6	5.7	4.8	4.9	4.9	5.9	64.0
7-14	11.3	8.5	6.0	5.9	6.7	45.0
15-19	7.1	7.7	6.3	4.1	3.9	45.8
20-64	61.6	63.1	65.4	67.4	66.7	85.5
65+	14.9	16.0	17.3	17.8	16.7	110.6
of all:						
women 15-49, %	26.0	26.5	26.2	25.4	23.9	76.7
Rural, thous	755.9	733.4	716.7	700.4	679.7	89.9
of which %						
0-6	8.0	6.8	7.7	8.1	7.6	85.0
7-14	13.9	11.4	12.6	13.2	14.0	61.0
15-19	7.4	9.2	8.2	5.5	5.3	64.4
20-64	61.3	57.1	60.1	63.4	63.8	98.4
65+	14.9	15.4	15.7	14.5	13.9	83.5
of all:						
women 15-49, %	22.3	24.7	26.0	25.0	25.1	101.1
of all urban, %	69.0	68.9	68.5	68.0	67.4	97.6

* Eglīte P., A.M. Cīce., I.M. Markausa. et al. Human Potential in Latvia Its Quantitative and Qualitative Reproduction at the rise of XXI Century. Rīga: LZA Ekonomikas institūts, 1999:69.

Rural residents in Latvia are under a particularly threat, because the educational level of people in all generations in rural areas is already lower than that of people in the country's cities (Figure 3). In part because of the specifics of age distribution in rural areas, this leads to an excessive concentration of intellectual potential in urban areas (Figure 4). If differences in the educational level and educational opportunities of rural and urban residents continue to exist in the future, economic and social development in Latvia's rural areas may be hindered.

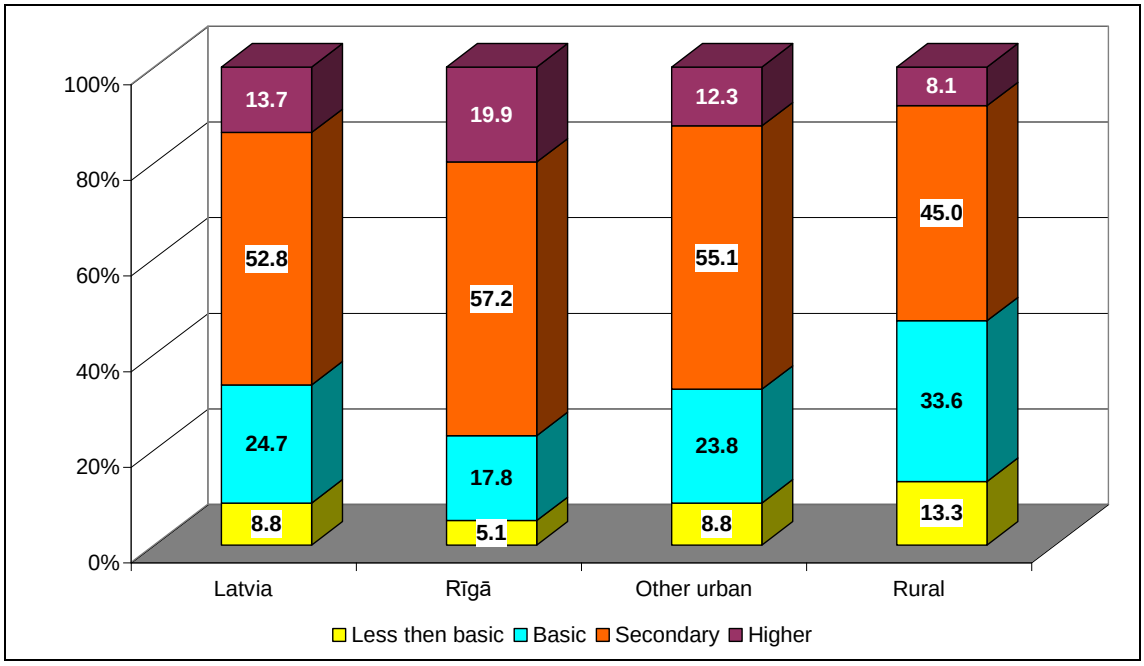

Figure 3. Distribution of Latvian population at age 15 and more by education, 1998 November, %.

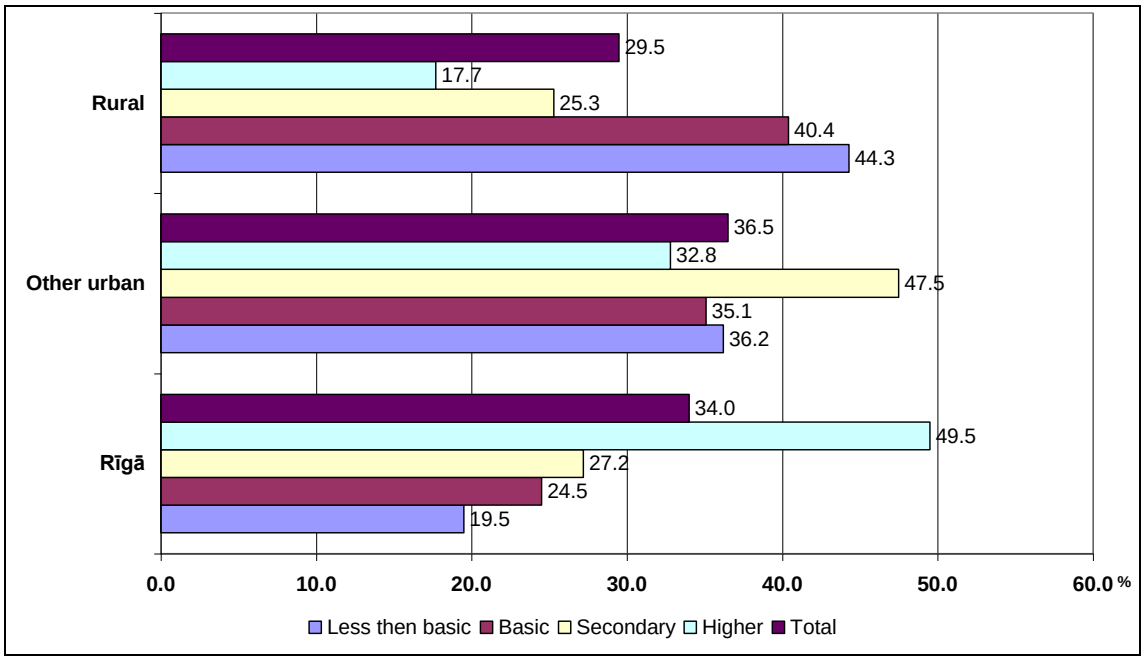

Figure 4. Distribution of Latvian population with by education level in the urban and rural areas of Latvia, 1998 November, %.

Conclusions

If the demographic processes of the 1990s are allowed to continue, the depopulation of Latvia will grow worse. This represents a true threat to the future of the country, and the situation is made all the worse by the fact that a majority of people in Latvia live in cities, where fertility rates are particularly low. The further migration of people from rural areas to cities is not, therefore, desirable.

In order to maintain a normal age distribution in the country and to ensure population reproduction in the future, there must be an urgent effort to increase fertility rates and life spans in all of Latvia's various regions. Of particular importance is the need to clean up the environment in cities and to create favorable social environments in the countryside.

The ability of young people to get a good professional education must also be ensured, despite the fact that the number of younger people in Latvia is declining and it is becoming increasingly difficult to fill some of the country's schools.

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The Humification Processes in Different Land-Use Soils In the Vidzeme Upland

Elga Apsīte, Oļgerts Nikodemus and Māris Kļaviņš

Introduction

The degree of humification in soil depends on the quality of the raw material (organic matter) and the environmental conditions [Swift et al. 1979; Orlov 1990]. Initially, the parent material of the organic matter determines the decomposition and humification processes resulting from plant residues (primary resources) and microbial and animal products (secondary resources). In the second place, the degree of humification is determined by taking into consideration the complex of abiotic and biotic factors (temperature, moisture, pH, bedrock, microorganism etc.). The third factor is human impact, for instance the tillage of fields, forest cutting etc.

This work analyzes the character of the humification (transformation of living organisms into humic substances) process in different land-use soils. The area under investigation is located in the Vidzeme Upland in the middle-eastern part of Latvia (Figure 1). The surface of the area has been developed by thick quaternary glacial sediments. The average amount of precipitation ranges from 800 to 850 mm per year. The main types of soil are the following: sod-podzolic eroded, sod-podzolic, sod-pseudogley soil in the highest part of the landscape; sod-gleysolic and lowland bog humus soil in terrain depressions (FAO: haplic luvisols, stagnic luvisols, haplic gleysols, histosoils). During the last sixty years many changes in the landscape have occurred due to human activities. It is common that old agricultural lands have been covered by forests and that large areas of wetlands have been drained and tilled. In our research area the forest soils were located mainly on old agricultural lands.

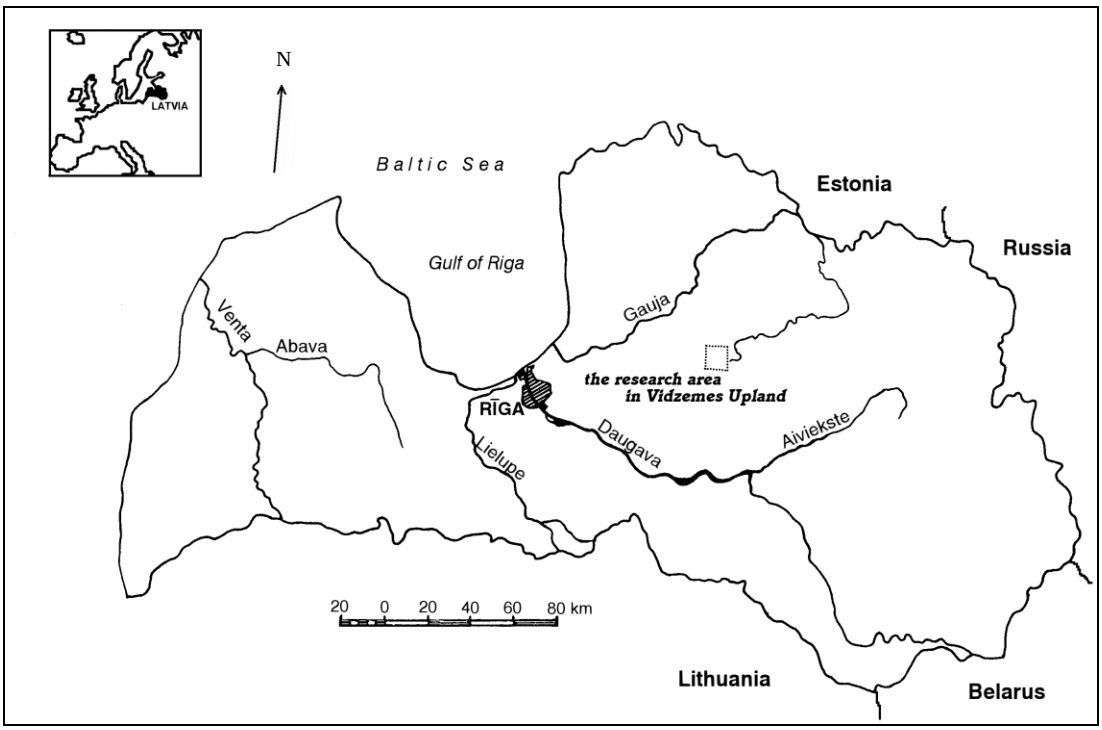


Figure 1. Map of investigated area.

Materials and Methods

In the present research thirty-nine upper horizon Ap and Ah soil samples have been analyzed (Table 1). The samples were collected during summer and fall seasons in 1991, 1997 and 1998. The genetical horizons are described within the national soil classification of Latvia [Kārkliņš et al. 1995]. Samples differ in terms of landuse, as well as in soil types. The degree of humification or the humus stability coefficient [Hargitai 1955] was determined, reflecting the ratio of humic acids to the raw organic matter. Organic carbon percentage and pH were determined using standard methods [APHA 1992].

Table 1

The humification coefficient, the content of organic carbon and pH in the upper soil horizons

Number of sample	Soil type	Horizon	Humification coefficient	Organic carbon %	pH_{H_2O}
1.	Sod-podzolic soil	AhE	0.15	6.00	5.24
2.	Sod-podzolic soil	AhE	0.15	4.62	5.36
3.	Deluvial soil	Ap1	0.23	2.70	7.84
4.	Sod-podzolic stagnogley soil	Ap	0.14	5.88	7.08
5.	Deluvial soil	Ap1	0.28	3.22	7.05
6.	Alluvial mucky-gley soil	H(Ah)	0.02	22.90	7.41
7.	Lowland bog mucky-humus soil	H(Ap)	0.01	41.30	7.94
8.	Alluvial sod-gley soil	Ah	0.16	6.30	6.98
9.	Humus-gley soil	Ap	0.09	15.65	8.20
10.	Humus-gley soil	Ap	0.06	20.62	7.88
11.	Sod-podzolic stagnogley soil	Ah	0.06	10.92	5.66
12.	Sod-podzolic stagnogley soil	Ah	0.16	7.40	5.47
13.	Sod-podzolic stagnogley soil	Ah	0.07	8.30	4.66
14.	Sod-podzolic soil	Ap	0.15	6.15	5.20
15.	Sod-podzolic soil	Ap	0.27	4.50	6.00
16.	Deluvial soil	Ah	0.17	4.65	4.84
17.	Sod-podzolic stagnogley soil	Ap	0.28	3.60	4.70
18.	Deluvial soil	Ah	0.14	7.55	5.26
19.	Sod-podzolic stagnogley soil	Ah	0.12	5.75	4.60
20.	Sod-podzolic soil	Ah	0.08	10.59	5.60
21.	Brown base unsaturated soil	Ah	0.14	9.70	6.24
22.	Sod-podzolic soil	AhE	0.10	11.85	6.08
23.	Sod-podzolic soil	Ap	0.34	2.70	7.60
24.	Sod-podzolic gleysolic soil	Ah	0.17	6.30	6.91
25.	Sod-podzolic gley soil	Ah	0.14	9.60	6.85
26.	Sod-podzolic soil	Ah1	0.19	7.40	5.18
27.	Lowland bog mucky-humus soil	Ah	0.38	3.00	6.12
28.	Deluvial soil	Ap2	1.05	1.32	5.96
29.	Typical sod-calcareous soil	Ap	0.26	3.37	6.56
30.	Deluvial soil	Ap2	0.86	1.57	6.55
31.	Sod-podzolic soil	Ah	1.07	1.63	6.23
32.	Sod-podzolic soil	Ah	0.58	2.03	6.57
33.	Deluvial soil	Ah1	0.57	2.80	6.87
34.	Sod-podzolic soil	AhB	0.36	2.38	7.14
35.	Sod-podzolic soil	Ah	0.46	4.16	6.61
36.	Deluvial soil	Ah1	0.78	2.14	5.60
37.	Sod-podzolic soil	Ah	0.42	2.82	5.70
38.	Sod-podzolic soil	Ah	0.48	3.30	5.70
39.	Sod-podzolic soil	Ah	0.36	3.90	5.95

Results and Discussion

A good correlation has been established between the degree of humification and organic carbon (Figure 2) which does not concern linear relationships. It indicates that the humification process is a complicated one. The research allows one to conclude that in sampling agricultural lands the highest degree of humification and the lowest content of organic matter is typical. In the first place, it is determined by the quality of organic matter. The soft and succulent residues are rapidly involved in the humification process. In a forest – especially a coniferous one – needles, twigs and other wood elements slowly decompose and become involved in the humification process. K.Krūmiņš [1929] has shown that the decomposition, as well as the humification process of plant residues, is determined by pH values of the parent material of the organic matter. For instance, pH ranges from 3.5 to 4.5 in fresh spruce and pine needles, but in the residuals of grasses and leaves of deciduous trees it ranges from 5.0 to 6.5. The course of decomposition is slower under lower pH values because the activities of the bacteria are slow down. This is typical for coniferous forest soils where there is a lack of basic material and a dominance of fulvo acid. These factors develop an intensive pozol process in the upper layer of the soil profile.

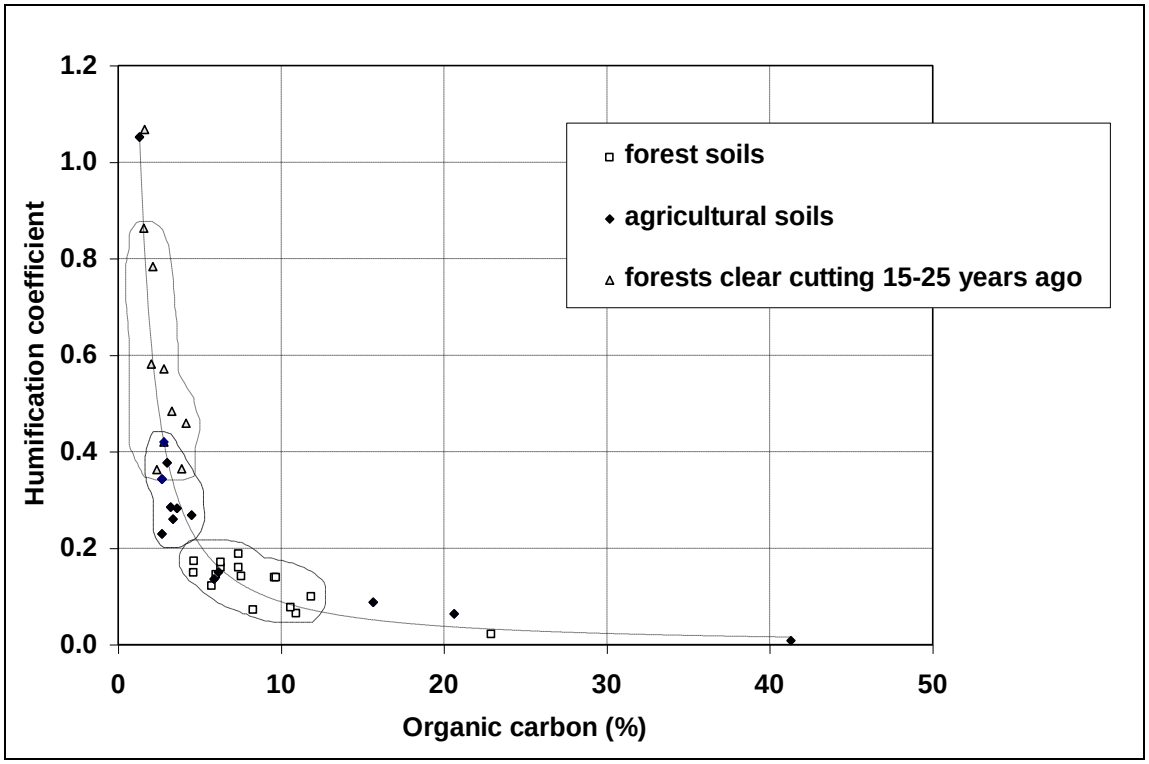


Figure 2. The humification coefficient and the content of organic carbon in different land-use soils

Secondly, the abiotic and biotic factors of the soil (the regime of temperature and moisture, pH, aeration, mineral composition, bedrock etc.) determine the degree of humification process as well. For example, the accumulation of organic matter and a slow humification process have been observed under low temperature and high moisture conditions in the soil. In terrain depressions a high groundwater table and anaerobic conditions occur. Figure 2 shows that comparatively low humification values (from 0.01 to 0.09) and high organic carbon content (over 15%) are typical for half-hydromorf and hydromorf soils, for instance sod-gleysolic, lowland bog humus soil.

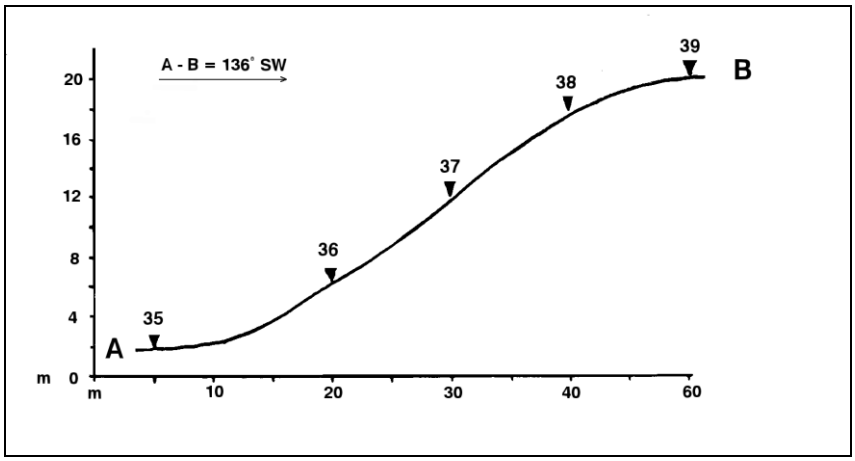
Thirdly, there is the factor of anthropogenic impact, for instance the tillage of fields, forest cutting etc. The samples of soil have been analyzed in the areas where forests were felled approximately 15-25 years ago. Figure 2 shows that there is the highest degree of humification (values from 0.36-1.07) in the upper Ah horizons. Previous research [Nikodemus, Mūrnieks 1997] revealed that the O horizons have disappeared and that the decreased concentration of

organic matter in the Ah horizons was due to forest clear cutting. It indicates that the abiotic and biotic factors in the soil have changed. Rapid decomposition of organic matter and more intensive humification processes take place in these areas.

The process of soil erosion can be mentioned as an indirect factor. It is connected with precipitation: the driven water flows from upper horizons into deeper soil profiles or the side of hills. In Latvia the podzol-forming processes dominate on sandy bedrock in coniferous forests [Bambergs 1969]. Under these conditions plant residues contain less carbon and nitrogen, but they have a lot of stable substances such as lignin, tannin, wax etc., which accumulate in the O horizon over mineral soil. Different acidic organic compounds that are soluble in water, for example fulvic acid, form after the decomposition of plant residues. These compounds are moved through the movement of water flows from upper horizons into deeper soil profiles along with the dissolution of different minerals in the Ah and AhE horizons.

The conclusion may be drawn in some cases that forest soils located on sandy bedrock possess higher coefficient values in comparison with the much heavier mechanical composition (loamy soil, sandy loam) of bedrock. Under these conditions the determined humification coefficient indicates that the O horizons is washed out and the Ah or AhE horizons are awash in humic substances, mainly fulvic acids (see Figure 2 and Table 1).

In the present study the humification coefficient, the content of organic carbon and pH have been analyzed for the upper Ah horizons on the side of hills where the forests were felled approximately fifteen years before; alders grew there in 1991. Figure 3 shows that at the top of a hill (Sample N39) the accumulation of organic matter and a slow humification process can be observed. On the hillside the soils have been eroded, and there is an accumulation at the bottom; therefore, deluvial soils develop at the foot of hill. In our research it is Sample N36 where the highest humification coefficient (0.78) and the lowest organic carbon content (2.14%) have been found in the upper Ah horizon. It can be explain in another way. Firstly, good abiotic and biotic factors develop at the foot of the hill, because the organic matter of eroded soils is involved in the faster decomposition and humification process. Secondly, at the top of the hill humic substances have moved when the driven water flows from the upper horizons into the deeper soil profile, as well as on the hillside; therefore, a geochemical trap of humic substances is formed at the foot of the hill. On the other hand, in Sample N35 the accumulation of organic matter and slow humification process can be observed due to poor aerobic conditions.



The sample number	35	36	37	38	39
Humification coefficient	0.46	0.78	0.42	0.48	0.36
Organic carbon content (%)	4.16	2.14	2.82	3.30	3.90
pH_{H_2O}	6.6	5.6	5.7	5.7	5.9

Figure 3. The changes in the humification coefficient and the content of organic carbon on the hillside (see samples N35-39 in Table 1).

The investigation of deluvial soils shows that aerobic and anaerobic conditions of soil play a significant role in the decomposition of organic matter, as well as in the humification process. Usually the thickness of the deluvial soil has to be over 50 cm. In the soil profile one can distinguish several Ah or Ap horizons. Figure 4 shows that a higher degree of humification is found in the Ap2 and Ap3 horizons due to good aerobic conditions of soil. Deluvial soil has developed over lowland bog humus soil with an increased groundwater table. The humification process is slower in the Ap4 and Ap5 horizons due to the anaerobic conditions of the soil.

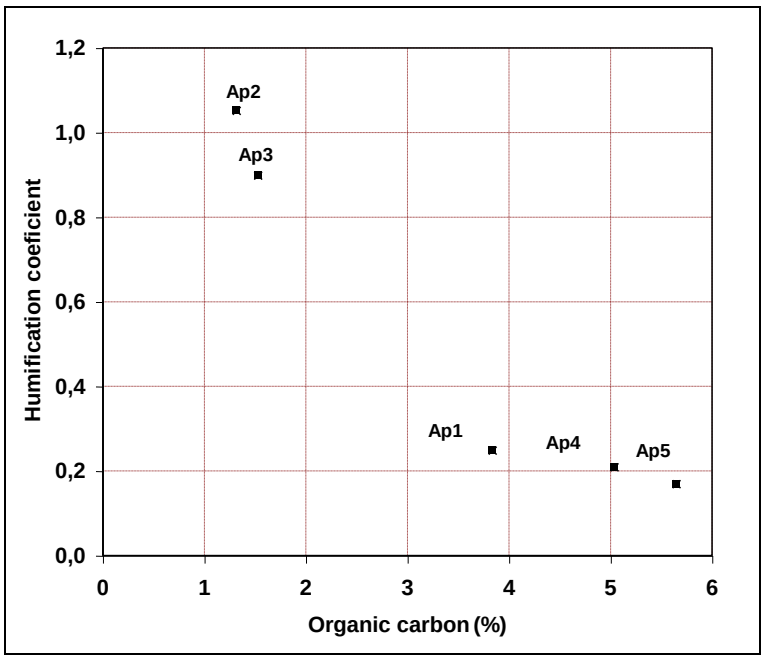


Figure 4. The changes in the humification coefficient and the content of organic carbon in the different Ap horizons of deluvial soils.

In this research the upper Ap or Ah horizons of many deluvial soil samples have been analyzed (Table 1 and Figure 2). We came to the conclusion that the degree of humification can be differentiated. It is partly dependent on the quality of humic material which comes from the higher parts of the hill. It can however be seen from the present research that the determined humification coefficient is one of the indicators which adequately characterizes the qualitative composition of soil humus.

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An Analysis of a Long-Term Meteorological Data Series in Riga

Lita Lizuma

Introduction

Climate changes and global warming are among the major problems in the world's climate today. Qualitative evaluation of these changes is based on an analysis of a long-term meteorological data series. It has been found that since the end of the 19th century, the global air temperature has increased by 0.3 to 0.6° Celsius [IPCC 1996]. Similar research projects have demonstrated changes in Latvia's climate over the course of the last century [Treiliba 1995].

The goal of this research is to analyze the most important changes in meteorological elements that have occurred in the city of Riga. The work is being done on the basis of a series of meteorological data collected at the country's oldest meteorological station – the one known as Riga-University. The station was established in 1795 and, along with similar facilities in Vilnius in Tallinn, is among the oldest in the Baltic region. Today it is used as a training laboratory by the Faculty of Geography and Earth Science of the University of Latvia, and regular meteorological observations are made there. Over the course of decades of observations, the actual location of the facility has changed several times, but since 1872 the observations have been taken in the densely built-up central portion of Riga, which contains extensive parks and gardens in addition to all of the buildings. The Riga-University meteorological station is located in the very center of the city, and its data can be used to study the conditions of an urban environment and changes therein.

Riga, with a population approximately 800,000 people, is the largest city in Latvia, and it is located on the Baltic Sea at 56°57'00" North and 24°06'45" East. Its weather conditions are affected by its presence in this moderate climatic zone. Riga and Latvia are generally dominated by westerly air flows which bring moist air from the Atlantic Ocean and the Baltic Sea. Occasionally they are replaced with easterly masses of air from Eurasia, northerly flows from the Arctic air basin, and southeasterly flows from Southern Europe. High pressure and low pressure systems are constantly forming in the region – they shift, change and disappear to make way for new pressure systems. This means that Latvia's weather changes frequently, often with fairly radical changes occurring quite quickly and sometimes very much out of season.

Materials and method

The correlation method was used to analyze air temperature, precipitation, the sunshine duration, cloud cover and atmospheric moisture (including water vapor pressure, relative humidity and vapor pressure deficit). Years of data were studied, correlation equations were calculated, and the validity of the relationships among the correlations was judged.

Air temperature

The average air temperature in the Riga city center between 1961 and 1996 was 7.3° Celsius. The lowest average monthly temperature has been recorded in February (-4.0°C), while the highest has been seen in July (18°C). The average 24-hour temperature amplitude ranged from 4.0°C in November and December to 9.3°C in May. The absolute minimum temperature in Riga was recorded in January 1942 (-31.4°C), while the absolute maximum was recorded in July 1885 (35.5°C).

It was first noted in the 1960s that Riga's air temperature was slowly warming [Temnikova 1969]. Later research showed that over the course of the last century the average air temperature has increased by 0.5°C in Latvia as a whole, and by 1°C in Riga [Treiliba 1995]. Analysis of the series of data concerning average air temperature over the course of 155 years (1851-1996) demonstrates an increase in the average temperature of 1.4°C (Figure 1a). The significance level of the calculated trend is 99.9%.

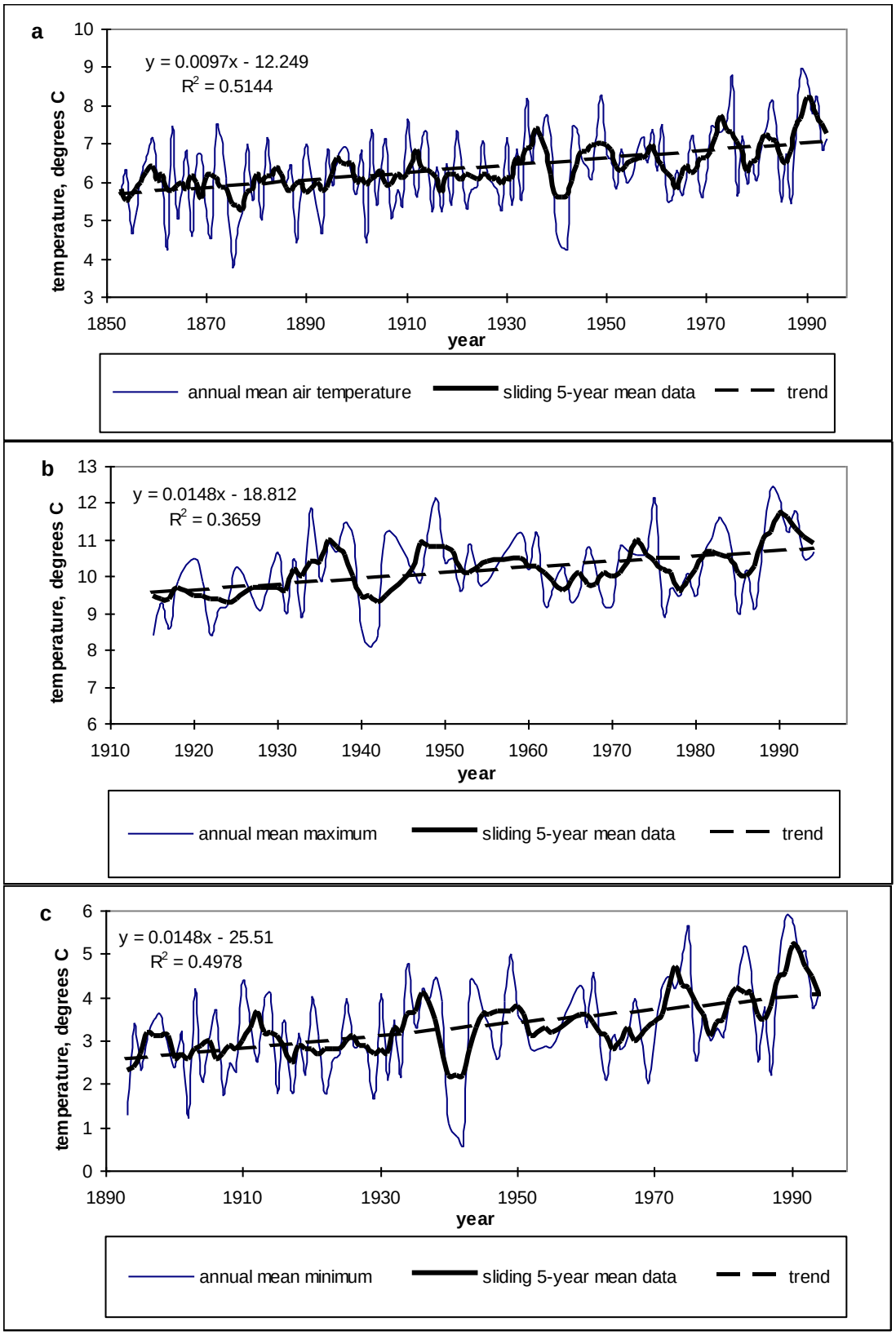

Figure 1. a) Annual mean air temperature; b) Annual mean maximal temperature; c) Annual mean minimal temperature.

The greatest increases in average air temperature have been recorded in the spring (March, April and May) and the early winter (November and December) (Figure 2). In the latter half of the winter and in the summer the trend has been less pronounced.

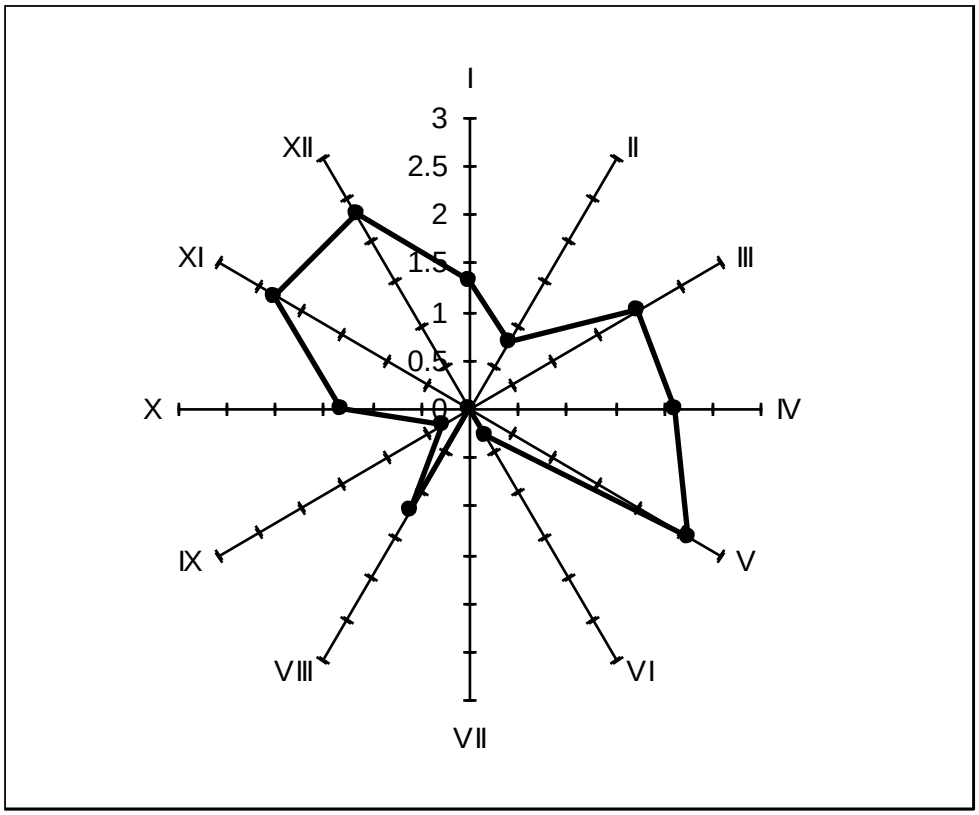

Figure 2. Increase of mean monthly temperature (°C) (1851-1996).

Mean annual maximum and minimum temperatures have also increased over the course of time – the mean minimal temperature increased by 1.4°C between 1913 and 1996, while the mean maximum temperature increased by 1.2°C (Figure 1b and c). The indicator does differ by season. In the latter half of the spring (April and May) and in late fall and early winter (November and December), maximum temperatures have increased more rapidly, while in July and September mean maximum temperatures have actually declined. The uneven shifts in minimal and maximal temperature are the cause for changes in the amplitude of temperatures over a 24-hour period. In the city of Riga we no longer see as intensive changes in air temperature over the course of a day and night as was the case at the beginning of the 20th century.

Precipitation

In Riga, as in the rest of Latvia, there is more precipitation than can evaporate. The annual average between 1961 and 1996 was 704 mm of precipitation – 33% (235 mm) in the cold part of the year (November-March) and 67% (469 mm) in the warm period (April-October). September has had the most precipitation (83 mm on average), while February has had the least (33 mm).

Annual precipitation volumes have increased by 7.5 mm since the beginning of the 20th century (Figure3). The significance level is 99.9%.

Precipitation has increased both in the warm (April-October) and cold (November-March) periods of the year. The increase has been particularly pronounced in the fall (September, October and November), less so in the spring. These changes can be explained through changes in atmospheric circulation and the greater presence of low pressure systems – possibly caused by the overall trend of global warming.

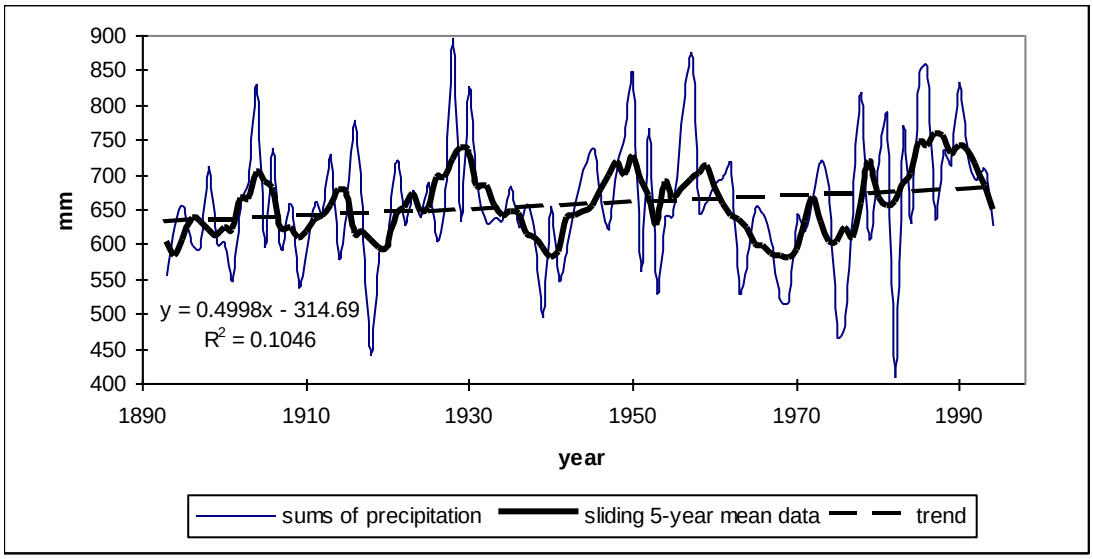

Figure 3. Sums of annual precipitation (mm).

Sunshine duration

The sun provides the Earth's major source of energy, warming the atmosphere and affecting other processes, too. Between 1968 and 1996, the sun shone over central Riga for an average of 2,097 hours per year (34% of the possible amount of time). The sun shines the least in November, December and January (25-35 hours, or 14-20% of the possible time), the most in May, June and July (260-275, or 48-51% of the possible time). Analysis of sunshine duration data between 1924 and 1999 showed that the annual duration has decreased by approximately 200 hours (Figure 4), with a significance level of 99.9%. The duration of sunshine has declined in a particularly notable way in the spring (April and March) and the early fall (September).

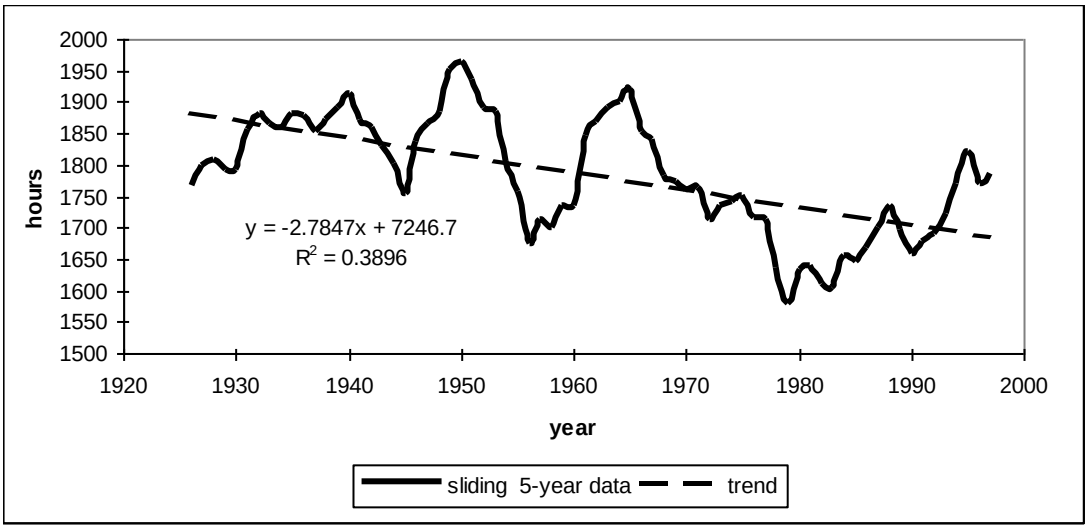

Figure 4. Annual sunshine duration.

Of course, the amount of sunshine is directly affected by cloud cover and fog.

Cloudiness

Cloudiness is measured in tenths, and it is a meteorological element which describes weather conditions very well. Cloud cover specifics and changes over the course of a year are influenced by circulation in the atmosphere, while changes in the cloudiness regime indicate changes in the atmospheric circulation process.

Principal maritime air masses over Riga and the proximity of the Bay of Riga lead to heightened cloudiness all through the year. The most commonly found forms of clouds in Riga over the course of the year are low clouds (60%), mostly stratocumulus clouds. There are also high clouds (17%), most often cirrus clouds, and middle clouds (15%), usually altostratus (15%).

Specific cloud types are associated with every season, and that is due to changes in the conditions which cause clouds to form. During the warm season (June, July and August), when convection processes are at their height, we mostly see cumulus and cumulonimbus clouds. Clouds which are associated with frontal processes, especially nimbostratus clouds, are more common during the season when low pressure systems are particularly active over Latvia – much more during the winter and least in the spring. In the fall and winter, when sea air cools down considerably, stratus and stratocumulus clouds are seen.

The average cloudiness over Riga has increased since 1950 (Figure 5a and b), both in terms of annual mean total cloudiness and in terms of annual mean low cloudiness. The increase in cloud cover (both overall and in terms of low clouds) has increased the most in the spring (March and April) and in the early fall (September). This has had a direct effect on the previously mentioned decrease in sunshine duration in the spring and the fall.

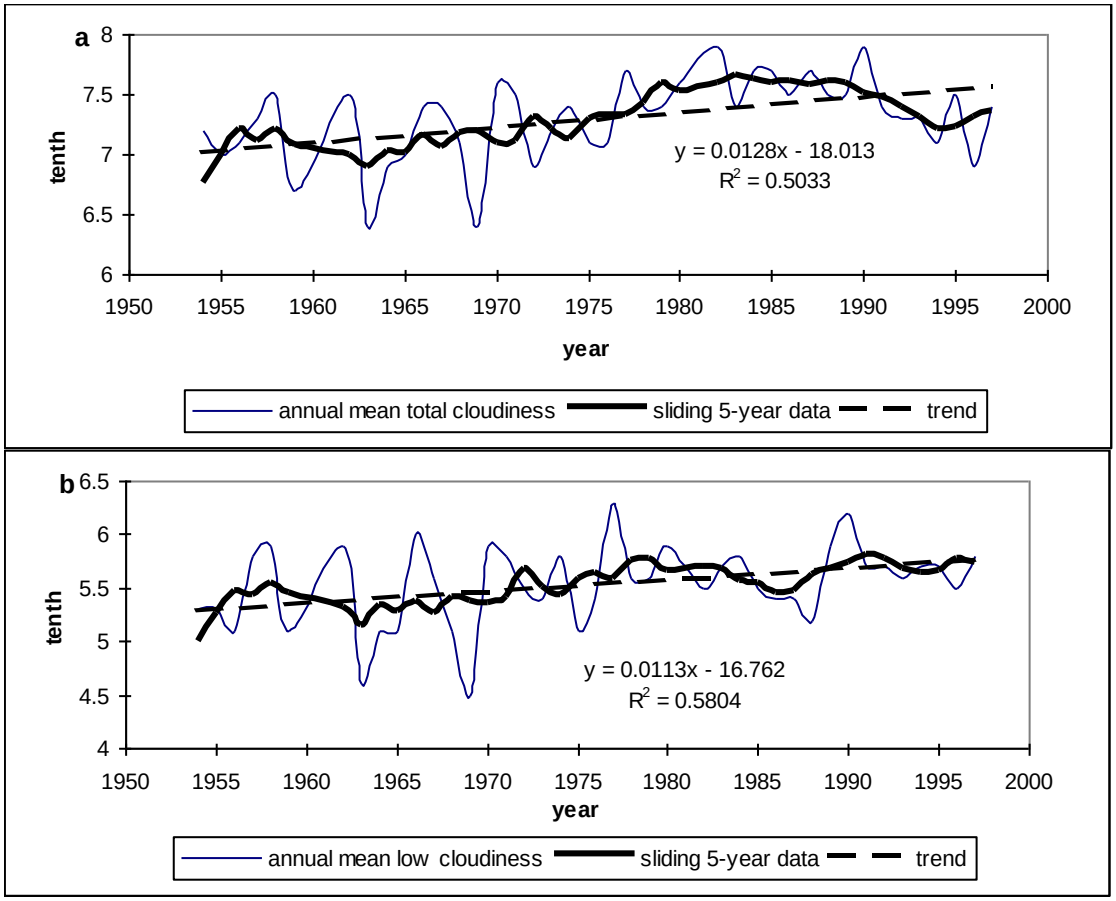

Figure 5. a) Annual mean total cloudiness; b) Annual mean low cloudiness.

Atmospheric moisture

Atmospheric moisture indicators specify the amount of water vapor in the air. This influences the way in which people feel outdoors, and moisture conditions also have much to do with the intensity of evaporation from soil and bodies of water, as well as transpiration and phenomena such as fog and dew.

Water vapor is a part of the atmosphere, and its volume can change on the basis of geographic conditions, the season of the year, specifics of atmospheric circulation etc.

Atmospheric moisture is characterized by the amount of water vapor in the air – partial pressure of water vapor (mb), relative humidity and vapor pressure deficit.

Indicators in this area that have been collected between 1961 and 1996 show that during the winter months – December, January, February and March, the mean water vapor pressure in Riga has been 4-5 mb, relative humidity has been at 80-90% and there has been a slight vapor pressure deficit (0.9-0.6 mb). When temperature rises, water vapor pressure increases – 6.6 mb in April, 9.5-9.9 mb in May. Water vapor deficit indicators also increase while relative humidity declines to 70% or 60% on a 24-hour average. The greatest amount of water vapor is found in central Riga during the summer – June and July, at 14.5-15.0 mb. During this time there is also the greatest vapor pressure deficit (5-11 mb) and lower relative humidity (62-64%). The minimal relative humidity level in Riga is seen not during the summer, but in the spring (17% in May), because temperatures rise during the spring while maritime air masses over the Baltic region remain cold and dry. Water vapor volumes in the air decline in the fall, as does vapor pressure deficit, but relative humidity increases.

Water vapor pressure

Analysis of years of data about vapor pressure shows that the average pressure in Riga has not changed during the course of the 20th century. Between May and November water vapor pressure in the air diminishes, and the significance level for July and August are 99% and 95%, respectively. In the summer and spring (December-April) the amount of water vapor pressure increases.

Pressure deficit is the difference between the saturated water vapor pressure at a given temperature and the actual water vapor pressure. The volume of the pressure deficit in Riga is on the rise, with a significance level of 99.9% (Figure 6 a and b).

This is particularly true in the latter half of the winter, as well as during the spring and summer (February-August). The pressure deficit indicators have not changed in the fall.

Relative humidity is the difference between the actual vapor pressure and the saturated vapor pressure at the same temperature. The average relative humidity in Riga has declined by 6% over the course of the last hundred years, at a significance level of 99.9%. Relative humidity has increased in all months, and the significance level is high for the correlation in all of the months. The greatest increase in relative humidity in the city of Riga has been seen in the spring (March-May).

Air moisture indicators are directly linked to and dependent on precipitation and air temperature. It was noted earlier that both air temperature and precipitation levels in Riga are on the rise. Because water vapor pressure levels have not changed significantly, while relative humidity has increased considerably, we can conclude that the air temperature increase is too rapid and the increase in precipitation insufficient to compensate for the decline in relative humidity. This is also affirmed by the tendency of the overall pressure deficit to increase, although in the fall the deficit has not changed and it was precisely at this time that we have seen a significant increase in precipitation levels, while air temperatures have not increased as rapidly. In short, Riga's climate has become not only warmer, but also drier.

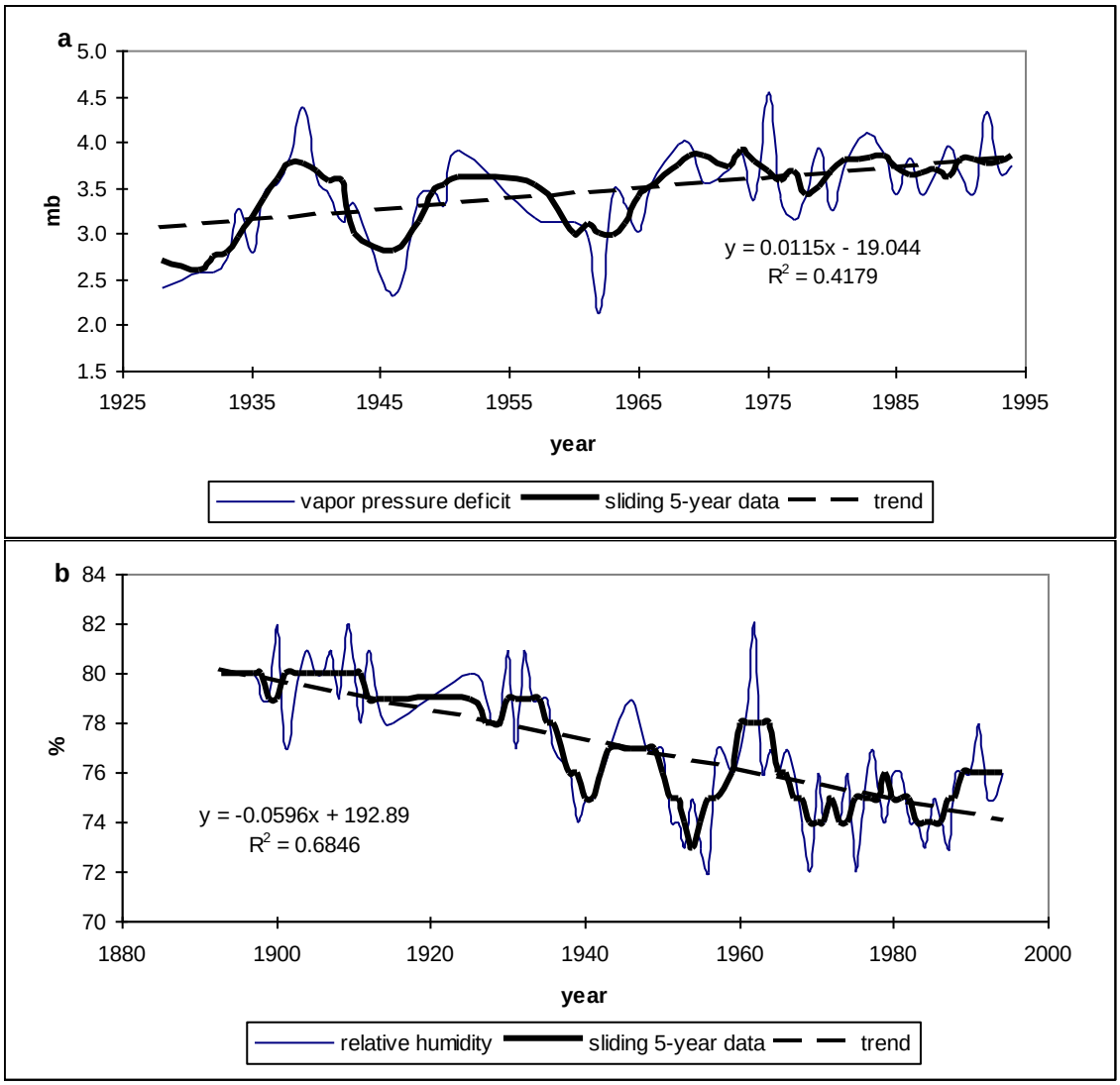

Figure 6. Air moisture conditions: a) Annual mean vapor pressure deficit (mb); b) Annual mean relative humidity (%).

Conclusion

This analysis of long-term data from meteorological observations has showed that the climate of Riga has changed during the 20th century. Air temperatures have increased, 24-hour amplitudes in air temperature have declined, cloudiness and precipitation levels have increased, sunshine durability has diminished. Atmospheric moisture conditions have also changed – there are both a greater vapor pressure deficit and a lower relative humidity in central Riga now than there were a hundred years ago. The causes for these changes include:

1) Global changes. The process of global warming and related changes in atmospheric circulation have led to higher air temperatures and greater cloudiness, which in turn leads to lower sunshine durability and greater precipitation;

2) Local changes. These data were obtained through meteorological observations in the city center, and it could be said that the changes have also been influenced by the urban environment. A city is both a producer and a consumer of energy, and it is a major source of pollution. Both of these factors lead to a more rapid increase in mean temperatures than is the case in surrounding territories. Over the course of the century new sewage systems have been installed in the city. These drain away precipitation and artificially reduce air moisture indicators. However, there is an increased volume of condensation nuclei over the city, which

can lead to greater cloudiness and precipitation. Still, it is most likely that the increase in cloudiness and precipitation that has occurred in Riga is more likely due to global changes.

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Trends of Meteorological Elements and Air Mass Frequency in Latvia Some Preliminary Findings

Anita Draveniece

Introduction

Quantitative observations have been carried out in Latvia since the end of the 19th century. The longest records available in Latvia are those for the station Riga-University in the city of Riga, which were begun in January of 1795. In practical terms, the site has been changed for several times, but since 1872 its observations characterize the central part of the city, which is compactly covered with buildings. Today one fifth of the meteorological observation network stations have up to 100 years and even longer records. The most prominent type of data is surface data; aerological data are available since the end of World War II.

N.Temnikova [1958] has given the most comprehensive climatic description of Latvia. During the Soviet period the data on various meteorological elements were included in climate reference books and atlases. Initially the records of meteorological elements were mainly used for the purpose of determining mean values, and the length of the observation records was considered a critical factor. Starting from the 1960s statistical processing of climatological data developed rapidly, and in the recent decades these data are used for calculating the trends. Particular interest in climate issues in Latvia in relation to problems of global climate change has developed during the last decade, the empirical records of meteorological elements have been examined in Latvia. The trends in annual average temperature, precipitation, total cloud amount and snow cover have been estimated.

The evidence of climatic warming in Latvia

Latvia is situated in Northern Europe on the coasts of the Baltic Sea and the Gulf of Riga between 56° and 58° N. It is dominated by a transitional type of climate, which results from the interaction of both maritime and continental air masses. The meteorological conditions are dominated by synoptic scale systems, but when they reach Latvia mainly from the west and south, they are often in a highly occluded state. Some of these synoptic systems are reactivated over the Baltic Sea. In spite of the comparatively small (the distance from the north to the south at its greatest is 210 km, and 450 km from east to west) territory, climatic differences within Latvia are quite remarkable. In terms of vegetation Latvia is situated in the contact zone or ecotone of boreal (coniferous forests) and nemoral (deciduous forests) biome, or the boreo-nemoral zone, which extends over Europe from western coasts of Scotland to the Urals. Moving eastwards from Scotland, the subzone widens reaching maximum width to the east at the Baltic Sea, and gradually grows narrower towards the Urals. On investigating the heaths in Latvia and Britain, Krauklis [1999] notes that the frontiers of the subzone are related to a balance of oceanicity and continentality, and a considerable prevalence of either of them involves narrowing of the other.

The 20th century climate warming and increase of precipitation over Latvia has provoked several essential macrogeographic transformations in Latvia's biota. Flora is enriched by new species, which basically originate from the regions south of Latvia: the amount of boreotemperate species decrease and that of submeridional and meridional increases. The proportion of coniferous trees, particularly pine (boreal element), decreases in forests and that of secondary deciduous trees and the broadleaf species oak, ash, maple aand elm (nemoral elements) increases. The above findings give evidence of a slow and gradual shift of the structures of macrogeographic vegetation from south towards north [Laiviņš 1998].

Air temperature observations show progressive warming over the territory of Latvia. Within the most recent hundred years a more rapid rise in the temperature has been observed in the second half of the period. During the first fifty years the annual mean air temperature increased on the average by 0.2° C, and the increase couldn't be linked to the urbanization and

economic development. In the latter half, the increase was 0.5°C, and the effect of industrial centers was evident because the mean annual temperature in Riga has increased nearly by 1°C. The range of air temperatures has become more moderate: the greatest positive changes have occurred in winter season, mainly due to low temperature rise at nighttime. It may also be noted that the annual amplitude of temperature variation has decreased. Changes in temperature are, of course, also reflected in changes of other meteorological elements. Annual precipitation has become more abundant, and it was more noticeable in those parts, where the prevailing winds and relief fostered ascending of air masses. Within a year the trend towards warming was conspicuously expressed early in the cold period [Treiliba 1995].

The temporal and spatial variability of snow cover duration in Latvia was studied more in detail. The duration of snow cover varies considerably, moving away from the seacoasts and the gulf, the exposure and elevation – generally being shorter along the coasts and in the western part of Latvia. The duration of snow cover in Latvia spatial variation was between 69 and 134 days. Applying linear regression analysis, a negative trend was detected; during the fifty-year time series (1946-1996), the mean decrease of snow cover duration was twelve days [Draveniece 1997]. The decrease was especially prominent in spring as the permanent snow cover melted on average ten days earlier. It may also be concluded that the coldest phase of the winter has moved slightly earlier.

The observation above is in line with the warming in most of Europe. The last decade was extremely warm. The First European Climate Assessment stated that the warming was not the result of higher temperatures of all air masses which passed through the area, but it was mainly an increased frequency of warm air masses passing, through which meant that certain changes in the atmospheric circulation over the area have taken place.

Development of air mass climatology

However useful the trends in seasonal or annual average temperature and other meteorological elements, these provide only modest insights about the causes. Kalkstein et al. [1990] recognized that air mass frequency patterns throughout the period might provide more useful information about any climate changes that have taken place. Initially, grouping of air masses was used for weather forecasting, and in that capacity air masses were applied even while more modern models overshadowed their utility. Since the late 1950s air masses were no longer designated on surface weather maps. Air mass climatology grew out of the so-called "Norwegian" school of synoptic weather analysis. In 1928, T. Bergeron formulated the concept of an air mass and proposed it as a means for explaining recurring weather patterns. During a visit to Russia in 1930 and 1932 Bergeron gave a great number of lectures (in German) on the "Bergeron ideas" to the most prominent Russian meteorologists, including Chromov. Within two decades (1934-1948) Bergeron's ideas on air masses, fronts and cyclones found their way into the textbooks in the three major languages of meteorology: Хромов (Chromov) 1934 (1st ed.); Swoboda's translation 1940; Pettersen 1940 (1st ed.) and 1956 (2nd ed.); Scherhag 1948; and many more [Schwerdtfeger 1980/81]. In Bergeron's terminology, an air mass is a vast body of air whose physical properties (temperature, humidity and lapse rate) are relatively homogenous in the horizontal extent, while abrupt changes are found along its boundaries, i.e. in the frontal zones. Especially in the midlatitudes, large seasonal and daily changes of weather result from alternating dominance by air masses derived from polar, subtropical, and midlatitude source regions. Growing as it did out of middle-latitude weather analysis, air mass climatology is most applicable in these latitudes where weather changes are frequent and air masses numerous.

Many researchers have recognized that the air mass concept has other values beyond forecasting. Air mass climatologies describe the climate of an area, they are useful in examination of annual meteorological variability, and they indicate major vegetation boundaries and even evaluate paleoclimate. Bryson [1966] concluded that the boreal forest of North America occupied the region between the mean southern boundaries of the arctic air in winter and in summer. Multanovsky [1934] compared a map with anticyclone trajectories and a map of vegetation and found a clear correspondence between the two. It turned out that larch and stone-pine was distributed to the west from the Nordkapp axis (a typical trajectory of the movement of

high pressure formation, which passes by the line Nordkapp – Onega Lake – Samara – Northen Kazakhstan). Secondly, an ultrapolar axis (Novaya Zemlya – Ladoga Lake – Hungary – Balkanes) was the boundary for the distribution of hornbeam. In recent years, air mass based approaches have been used widely to evaluate environmental problems. Brinkman [1993] found that air mass based scenarios within the framework of climate change could yield important insights. Air mass characteristics and frequencies can be expected to be different in a warmer world.

Methods of air mass classification

Most approaches to air mass classification are either subjective or objective. Subjective approaches were the first used. Trajectory analysis of air masses back to their source regions, for example, yielded familiar general nomenclature (e.g. maritime Polar). Subjective analyses have simple data requirements and are often conceptually concise, but they suffer from a lack of numerical precision and from difficulties with replication and error assessment. Subjective approaches are nevertheless still used. Subjective systems pay little attention to the ranges of temperature and moisture associated with an air mass type, the changes in these with the seasons, or the implications of air mass modification and mixing. For many potential applications where the range of characteristics associated with an air mass is important, the imprecision of the subjective technique is a serious limitation.

Thorough scientific analysis is undoubtedly inseparable from objective methods of air mass identification, and such methods have been developed. Bryson [1966] examined air mass distribution over central North America using two independent techniques. Firstly, he used daily surface wind trajectories and monthly streamlines to trace air masses back to their source regions; secondly, he utilized an objective approach, which is called the partial collective method, to resolve daily maximum temperature frequency distributions into component normal distributions. In Europe, Geb [1981] built a climatology of air mass types in Central Europe based on the source region, modification and stability. Besides the basic types, Geb [1971] introduced two intermediate air mass types: subarctic and subpolar air masses. He also developed a new method for a practical determination of air masses that was based on the climatological identification of air masses, which at the same time were checked with respect to their typical heat content. Schwartz [1991] has developed an integrated approach for air mass classification combining the advantages of both subjective and objective approaches, applying it to 850 mb level data in the north central United States. The methodology has proved to be numerically precise. The 850 mb level is close enough to the surface (ca 1300-1500 meters) to reflect surface conditions, but distant enough to be influenced by diurnal surface processes, which create temperature changes in the lower atmosphere. Schwartz [1991] acknowledged that the 850 mb temperature provides a reliable way to differentiate Continental air from other types.

The critical properties of air masses are temperature, humidity and lapse rate. The dewpoint can be used as an air mass moisture criterion. Dew-point temperature is conservative in respect to temperature changes at constant pressure as long as no water vapor is added to or withdrawn from the air. Schwartz [1991] showed that the 850 mb dewpoint serves the purpose better than surface dewpoint. By international convention the upper-air sounding stations report temperature (T) and dew point (T_d) at standard pressure levels and at significant points; in Latvia, the statistics of upper-air soundings include the records of temperature and the difference between the temperature and dew point temperature ($T- T_d$), i.e. hygrometric difference.

Air mass classification in Latvia in 1950s and 1970s

In Latvia, N.Temnikova [1958] first classified air masses: maritime air masses were observed 183 days per year (133 midlatitude or polar, 50 arctic), continental air masses were observed 169 days per year (147 midlatitude, 18 arctic, 4 tropical) and there were 13 days of unclassified arctic air.

It must be admitted that the terminology of midlatitude air masses causes some confusion, since polar air masses, in reality, originate at latitudes 45-66°. Identification of particular air mass types was a subjective, qualitative process based on analyst skills. Unfortunately, no

reference has been found about the period chosen for the analysis and about how these results were obtained.

Table 1

Air mass frequencies at station "Riga" for 1966-1975

Years	Continental tropical air masses (cT)	Polar air masses		Arctic air masses	
		Maritime cP	Continental mP	Maritime mA	Continental cA
1966	22	161	99	46	37
1967	27	200	71	38	29
1968	28	172	64	76	26
1969	17	154	102	52	40
1970	11	181	96	47	30
1971	23	193	74	47	28
1972	30	174	94	43	25
1973	18	206	51	55	35
1974	14	169	116	37	29
1975	35	189	60	57	24
Average	24	179	82	49	31

[Glazatcheva, 1988]

In later years the air masses at the station "Riga" were identified for the period 1966-1975 by an analyst of the Riga Weather Bureau [Glazacheva 1988]. Again, an analyst compiled the above tables using a subjective approach. The table shows on average a noticeable prevalence (218 days) of maritime air masses. As stated by Folland et al. [1990], Europe experienced less westerlies in the late 1960s and a return to stronger westerlies happened in the 1980s.

It is because of the interplay of so many different types of air masses that Latvia experiences very changeable weather. Polar air masses are derived from areas close to Iceland; continental air masses from eastern Europe have easy access westward; in autumn, winter and spring cool arctic or subarctic air reaches Latvia; also tropical air masses affect Latvia.

Supposedly, the integrated approach described above could be successfully applied to classification of air masses over Latvia, based on the following argument. Schwartz [1991] classified air masses of the north central Unites States – an area of 12 states, including Wisconsin and Michigan. Studying the problems of natural resources, Ermakov [1970] examined the subject of geographical region analogues. The area of the Baltic countries, Latvia included, and the area of the Great Lakes (Wisconsin and Michigan) were determined to have a clearly expressed similarity of both individual components of the geographical environment and the entire complex as a whole. Moreover, as to climatic indices, Ermakov pointed at exceptional similarity, and in some cases even at identity.

Subjective portion of integral method to air mass classification in Latvia

Presently, an air mass analysis over Latvia is being conducted by this author as a part of a PhD thesis at the University of Latvia, based on the conventional air mass names and concepts used by Temnikova [1958].

It must be admitted that in Latvia, likewise Estonia, more transformed air masses can be observed than in central Europe, where the prevailing air mass is maritime [Post et al. 1998]. Maritime polar air is cold and moist, and it develops over the cold ocean waters of North Atlantic. Because the prevailing winds in Europe are westerlies, Latvia is effectively far from the major air mass source region – the Atlantic Ocean. On their long way the air masses arriving over Latvia have lost their original properties and have transformed. Therefore some amendments should be introduced in the air mass classification scheme given by Temnikova and Glazacheva. The advection of major, e.g. maritime polar air masses, over Latvia is usually caused by one of three synoptic processes. These are as follows: 1) “diving” cyclones (fast movement from north-west to south or south-east); 2) movement ahead of a concluding

anticyclone; 3) ultra-polar (from north to south) movement of an anticyclone, which has formed in a mass of maritime polar air over the Barents Sea. In addition to the analysis of surface weather maps, the temperature and dewpoint curves are drawn. The prevailing 500 mb flow direction at the station is considered, and the European circulation patterns are utilized [Gerstengarbe et al. 1999]. As regards the latter, Keevalik et al. [1999] have found that there is nearly no difference between suitability of circulation patterns for central Europe and for Estonia.

The data for the present study consist of daily 2.00 A.M. and 2.00 P.M. 850 mb temperature and dewpoint data, as well as surface data from TM-1 tables (dewpoint, atmospheric pressure, cloudiness). The 850 mb data are available at two stations in Latvia: Riga and Liepaja. However, the upper level data for Liepaja are only available since 1992.

As an example of the subjective portion of identifying air masses, the daybook for Riga, January 1992 is presented (Fig. 1), where three curves are drawn. The curves of 850 mb temperature and dewpoint at 2.00 A.M. and 2.00 P.M. (local time) demonstrate the interchange of air masses and frontal zones within the particular month. The third curve is the surface atmospheric pressure; diurnal boundary layer processes influence the latter, but the fluctuations are rather small: in midlatitudes they don't exceed 2 mb [Zirnītis 1968]. It seems reasonable to view the 850 mb curves separately from each other and coupled, since such an approach enables one to check whether an air mass has been determined correctly using the charts. The closeness or remoteness of both curves indicates moisture content of the air mass. Apparently, sharp changes in dewpoint temperature occur with frontal zones crossing the station location.

The last day of December 1991 and the first half of January 1 weather conditions over Latvia were controlled by a high-pressure system and arctic air penetrated with northern winds. In the afternoon of January 1 the situation changed. The surface air pressure went noticeably downward and remained low for several days. The first decade was dominated by zonal circulation and cyclones derived from the Atlantic Ocean or, in other words, from areas close to Iceland, brought maritime polar air and unstable weather. The situation changed noticeably on January 10, which according to Gerstengarbe et al. [1999] was classified as "unclear". Rapid growth of surface air pressure was fixed, and 850 mb temperature and dewpoint temperature decreased noticeably. A high pressure area developed over the British Isles, and Latvia experienced the influence of a high pressure system, which stretched as far as Finland. However, on January 11 a new cyclone came from the Atlantic Ocean. On January 13 the synoptic situation (British high) had developed this way: almost northern winds (340-345°) brought marine arctic air, which manifested itself through 850 mb temperature below -10°C. However, it was only a spell of arctic air, which was again followed by a maritime polar air from the Atlantic. On January 17 a cold front crossed Latvia: both 850 mb temperature and dewpoint temperature went downward, atmospheric pressure was decreasing steadily, and afterwards almost northern winds brought arctic air. On January 19 a high pressure system developed over northern Europe and northeastern winds brought maritime arctic air. The atmospheric pressure curve showed a gradual increase and stayed above 1030 mb for six days, which was caused by a high pressure system over central Europe.

Within the anticyclone, pressure gradients are weak, winds are light, and slow subsidence induces radial drainage of air away from the center, which assures little mixing of foreign airstreams into the anticyclone.

The last decade was dominated by meridional atmospheric circulation. Based on the Catalogue of Indexes (forms) of Atmospheric Circulation by Wangengeim-Girs, fifteen days of January 1992 were dominated by zonal circulation and 16 days by meridional circulation.

During the third decade high pressure was observed over Central Europe, and Latvia was in the very eastern part of this system. Latvia's weather was influenced by warm and cold fronts (on January 28 and 29), which were associated with cyclones derived from the northern Norway, and consequently, maritime polar air. On January 29 a spell of arctic air occurred with northern winds. The end of the month brought one more low pressure system coming from northern Scandinavia.

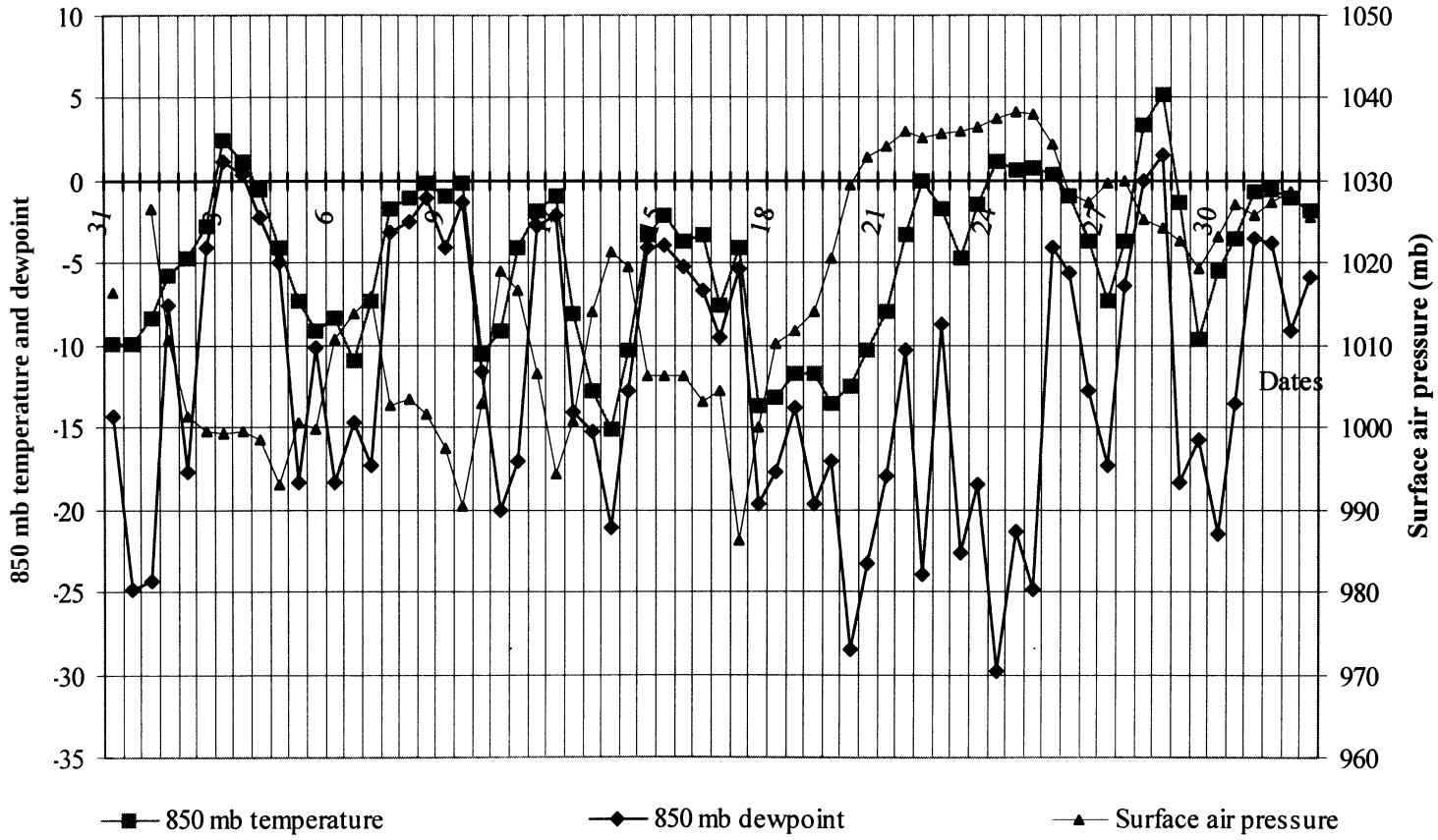

Figure 1. Air mass, 850 mb temperature and dewpoint, and surface air pressure daybook, January 1992.

The above analysis should result in determining the number of days with maritime polar, polar, maritime arctic air, and unclassified days or transitional conditions, which cannot be properly classified. Schwartz et al. [1985] admitted that these conditions could occur during or just after the passage of a frontal zone through a station. Since even a cold front is a broad (10-100 km horizontally) transition zone, it takes several hours (depending on the regional surface energy budget prior to passage) for the atmosphere to assume the characteristics of the new air mass behind the front. Schwartz [1991] showed that 20-25% of days were regarded as "unclassified".

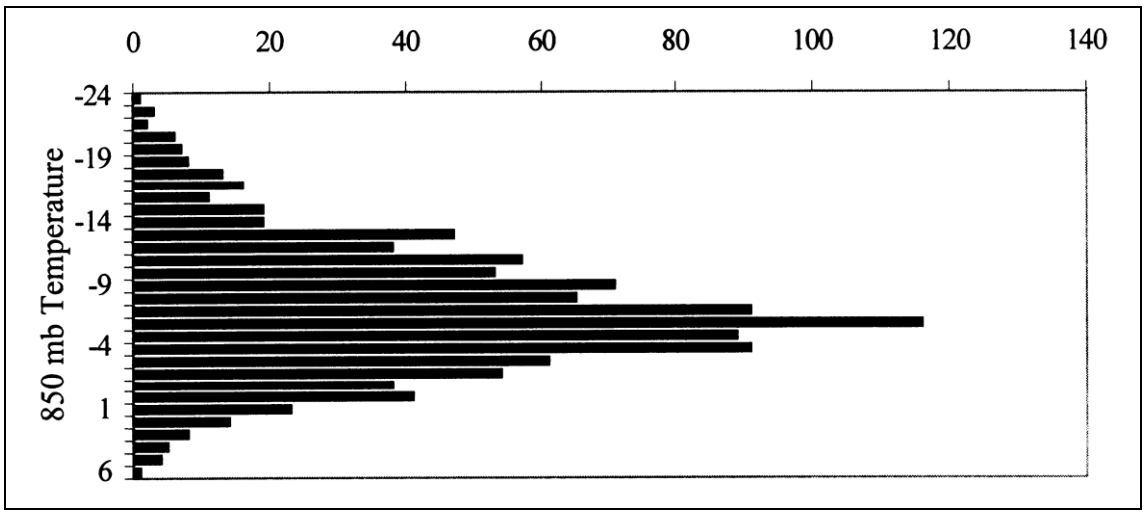

Figure 2. January 850mb temperature frequency distribution for Riga (1981-1998)

Further, the subjective analysis is followed by the objective portion, using the partial collective technique to identify normal curve components in the 850 mb temperature and dewpoint frequency distributions for each month. It is assumed that the aforementioned components are associated with the real temperature-moisture value ranges for each air mass type [Bryson 1966]. In order to demonstrate this, Figure 2 was compiled (i.c. 1072 values, from 1981 to 1998). The partial collective procedure will show the normal curves for each air mass type. Each component shall take the form of a normal curve and represent air from a distinct geographic source region. The objectivity of the said procedure, however, is compromised by the requirement of user-supplied initial values of statistics for the component normal curves, which are obtained via subjective portion of analysis. Figure 2 displays one distinct maximum with 850 mb temperatures from -3 to -7°C, which should be attributable to maritime polar air masses. Although it is untimely to speak of scientifically proper results, it seems that the described approach could be successfully utilized to develop air mass climatology for Latvia.

Conclusions

The trends of separate meteorological elements (temperature, precipitation and duration of snow cover) give evidence of climate warming in Latvia. Essential transformations in Latvia's biota that are associated with climate change are also observed.

Air masses can provide the basis for comprehensive description of an area's climate and its causes. Empirical climate change studies could be more beneficial if they would go beyond simply reporting fluctuations in average values of meteorological elements as temperature. Air mass classification in Latvia has been performed in the 1950s and the 1970s; however, the applied methods of identifying air masses were subjective and didn't report the range of temperature and moisture conditions.

The interim results of daily air mass characteristics show a remarkable variability of air masses and fronts, and it is clearly seen that within the eighteen years from 1981 to 1998 January was dominated by maritime polar air masses.

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Tourism Development in the Context of Sustainable Development In Latvia

Oļģerts Nikodemus and Maija Rozīte

Introduction

The role of tourism in the Latvian economy

Since the restoration of Latvia's independence and the country's move toward a market economy, tourism has been seen as a very promising business sector. At this point tourism represents only 3.5% of the country's GDP, although the various branches of the economy that are directly and indirectly involved in tourism represent 5% of GDP according to experts from the European Union [EU Studies 1997].

The flow of international tourists in Latvia cannot be compared to that in neighboring countries. In 1999, there were 544,000 foreign tourists who arrived in Latvia, but at the same time 787,000 residents of Latvia traveled abroad. The number of foreign visitors, in other words, is lagging considerably behind the number of Latvian tourists going abroad. In order to avoid any unfavorable effects of tourism, Latvia's society is interested in developing durable tourism. To this end in 1997 and 1998, the Latvian Ministry of Environmental Protection and Regional Development asked the University of Latvia's Faculty of Geography and Earth Science to conduct the research project "Tourism in the Context of Sustainable Development".

Experience from previous research projects

Given that for many years Latvia has attracted tourists from other countries, as well as the fact that Latvia's residents are active travelers, the country has accumulated considerable experience in studying the effects of tourism on the environment and the response that the environment provides to tourism. Based on an evaluation of potential tourism resources, a study group led by A. Melluma [Melluma, Rungule and Emsis 1982] developed a series of proposals on setting aside specific territories for leisure activities in Latvia. The development of these areas would have been based on the fundamental principles of sustainable development, and the aim was to maintain the most valuable and appropriate territories for tourism development.

There have been few research projects in Latvia so far that have evaluated the influence of tourism on the cultural environment. Among significant research in this area, we can cite the research project that focused on the Gauja National Park [Melluma, Rungule and Emsis 1982]. The experts made note of such negative consequences of tourism as vandalism and hooliganism.

Among those who have studied the effects of tourism on man-made environments have been I. Emsis and A. Melluma. One project [Emsis and Melluma 1986] found that in the Soviet era, fishermen's homesteads along the Bay of Riga were being reconstructed for tourism purposes, and this led to the loss of architectural and visual specifics that were typical of fishing villages. In the 1980s, camping sites were set up along the shore (at Vitrupe, Saulkrasti and Engure) that did not in any way correspond to the requirements of environmental protection.

The effects of tourism and recreation on the natural environment have been studied for quite some time in Latvia. In the 1970s and 1980s research concerning the ecosystems of forests was done by specialists from an institution called "Silava", as well as by scientists from the University of Latvia. The researchers found that the forest ecosystems that were being used for recreation were polluted with garbage, and many trees had been physically damaged. As tourism and recreation expand, forests are split up; this serves to hinder the migration of plants and animals while simultaneously reducing the durability of ecosystems against anthropogenic burdens. The greatest effect in forests arises from trampling by humans, which results in overall changes in the ecosystems.

Research methods and materials

An analysis of tourism policy and practice

The researchers who focused on an analysis of tourism-related policy chose specific territories in Latvia – Jurmala, Sigulda, Jurkalne and Aglona. The methods for analyzing proper tourism practice were taken from the European Community's report on tourism and the environment in the context of sustainable development [European Community 1993].

Research on the reciprocal effects of tourism and the environment

The reciprocal effects of tourism and the environment in the territories that were selected were studied on the basis of the scheme: condition – pressure – reaction – changes.

The researchers used a qualitative analysis of the flow of tourists in order to look at the reciprocal effects of tourists and local residents, interviewing 700 people in sample territories. Of the 700 respondents, 300 were local residents, while 400 were travelers. The structure of respondents was in line with the social and demographic profile of Latvia.

In order to study the pressures placed on the local environment by tourism, the analysts counted up the motor vehicles owned or used by tourists, and they conducted an inventory of tourism-related objects.

In order to research the status of the local environment, the researchers used data from the Latvian Meteorological Board and the National Center for Environmental Health concerning the quality of local air and water, as well as various research projects that utilized the methods of bio-indication.

The selection of sample territories to be studied and their characteristics

In order to develop a methodology for studying the reciprocal effect of tourism and the environment and to check out the methodology in practice in Latvia – the final aim being to create proposals aimed at optimizing the reciprocal effect of tourism and the environment – several sample territories were selected. These were territories that corresponded to the following requirements: each territory had a developed form of tourism; research had been done in the territory; tourist-related activity could be observed during the period of the study, and changes in tourist activity could be forecast; the size of the territory had to be appropriate for detailed studies.

Once these factors were put in place, the following territories were chosen: the Vidzeme shoreline of the Bay of Riga, Jurmala, Sigulda, Aglona and Jurkalne.

Sigulda is the most popular tourist destination in Latvia, and it contains a number of national tourism objects and resources: the Gauja National Park; the Turaida Castle; the ancient Gauja Valley with its caves; well-developed tourism traditions; great flows of tourists in the summer, on weekends and at times of special events; well-developed cultural, recreational, athletic and ecological tourism.

Information about the number of tourists in Sigulda now and in the 1980s shows that the number of tourists has fallen approximately fivefold – from some one million tourists a year to about 200,000 per annum (Figure 1).

The most important environmental problems caused by the flow of tourists in Sigulda are the following:

- soil erosion and landslides on the steep sides of the Gauja valley, the result of which has been the destruction of Devonian rock formations that have always been popular among tourists;
- the absence in the city of Sigulda of environmentally proper drainage water purification systems, the result of which is that pollution from objects of tourism infrastructure has been allowed to flow into the Gauja river.

The **Vidzeme shoreline** is the second largest recreational area in the country. There is a high concentration of summer homes and gardening associations along the shores of the Bay of Riga. In the territory there are unique natural objects such as the rocky coastline of Vidzeme and the associated meadows, the Piejura nature park, and the Salaca biosphere reserve. The territory is included in several international territorial development and management projects (e.g. a zone

for strategic and visionary development in the area Tampere-Helsinki-Tallinn-Riga, the project "Via Baltica-Turistica").

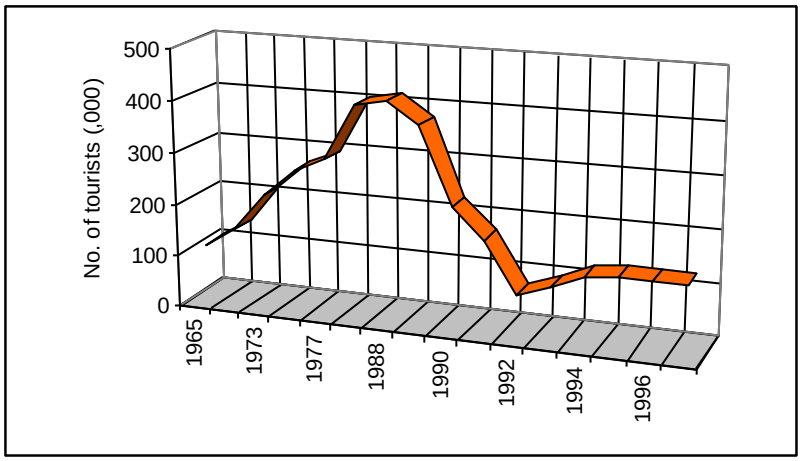

Figure 1. The number of tourists at the Turaida Castle and its grounds in Sigulda, in thousands.

The most important problems associated with the flow of tourists in this region are the following:

- an insufficiently well-developed tourism and road infrastructure, the result of which has been conflict between tourists and landowners;
- a disorganized system of developing new roads and accommodation facilities;
- difficulties with sewage and household waste in the areas of summer homes.

Aglona is the most unique religious tourism center in the Baltic region, and every year there are two days when huge numbers of tourists and pilgrims gather in the area. These guests are concentrated in a very small territory – the complex of the Aglona Basilica. In 1997 the number of tourists in Aglona exceeded 230,000.

The most important environmental problems in Aglona are not directly associated with the flow of tourists. Rather, they are part of the insufficient environmental infrastructure in the local parish:

- sewage purification is a mechanical process, and the capacity of the system cannot handle the overall amount of sewage that is produced;
- the local waste dump is in a protected area, and it is far out of line with environmental requirements.

Jurkalne is a small parish with just 390 residents in 1997, and the territory has been little-touched. Between 1945 and 1989 it was declared a Soviet frontier area. The territory includes a unique geological formation – a vertical seashore. A World Wildlife Fund project is being developed in this area, and the parish is seen as one of the most promising tourist regions in Latvia. Jurkalne is experiencing a gradual increase in the number of tourists. The tourist flow is distinctly seasonal in nature.

The most important environmental problem in the parish is the fact that the seashore is gradually falling away as the result of natural abrasion. The local road infrastructure is threatened as a result of this.

Jurmala is a spa town which during the Soviet period was a nationally significant location for spas and massive tourism in the USSR. In the early 1990s, when the main market for Jurmala's services disappeared (tourist groups from the Soviet republics), the area experienced a severe economic crisis.

In Soviet times Jurmala's beaches and surrounding territories were poorly developed, and the number of tourists exceeded ecological capacity, which resulted in a number of environmental problems – water pollution, increasing levels of everyday waste, and trampling

of forest ecosystems. The most significant current problems in Jurmala vis-à-vis tourism development are the following:

- the number of motor vehicles in the area has skyrocketed, and this has led to increased air pollution;
- there have been changes in the ecosystems of local pine forests because of trampling by feet and synanthropization;
- the wooden buildings that are typical of Jurmala have been degraded, and they've gradually been replaced with modern structures.

Results and discussion

Government tourism policy

Good practice in the area of tourism development must necessarily be based on the elaboration and implementation of proper tourism policies, using various resources and instruments for this purpose. These can include theoretical considerations, development plans, applied projects, territorial planning, and environmental protection plans. Most effective are economic instruments: investments aimed at promoting tourism, crediting and tax policies, state or local government financial aid in the implementation of major projects, and the development of tourist-related infrastructure. A proper tourist policy must also be aimed at the implementation of the principles of sustainable development in practice.

It is true that successful tourism development depends greatly on the tourism development policies that are implemented by the state.

In 1997 a conceptual document on Latvian tourism development was produced at the national level. The document sets out the structure for tourism management in the country, as well as the political instruments, long-term goals, and necessary undertakings that are to be brought to bear.

The basic law to regulate tourism development in Latvia is the "Tourism Law", which took effect in 1999 [Tūrisma 1998].

An analysis of the basic documents and legal acts that set out the priorities of tourism development in Latvia and that regulate the overall process shows that many of the principles of sustainable tourism are directly or indirectly reflected in Latvia's national tourism policy.

The development of tourism is also regulated directly or indirectly by other legal acts in the Republic of Latvia, including various environmental protection laws. In tourism development that is based on the principles of sustainable development, those legal acts that regulate development planning are of great importance. In Latvia these include the law "On local governments" [Parliament 1994]; the law "On the planning of territorial development" [Parliament 1998]; and regulations "On territorial planning" [Cabinet of Ministers (No. 62) 1998].

In 1998 Parliament adopted a program for rural development in Latvia, and this represented the first attempt to take an integrated approach toward the resolution of social and economic problems in the rural areas of the country. One of the ways of promoting greater diversity in rural employment that is mentioned in the law is rural tourism.

An analysis of Latvia's legal acts and other documents shows that the government's policy is aimed at the development of sustainable tourism. The greatest problems are caused by the real-life implementation of those policies.

An analysis of local government tourism policies

Policies aimed at proper tourism practice must be aimed at the implementation of sustainable development principles. Good tourism practice must necessarily be based on tourism development strategies. An analysis of local government tourism policies shows that local governments are using only territorial planning as an instrument of good practice. The territorial plans contain good tourism practice principles at the conceptual level, but in implementing territorial plans some local governments have retreated from the principles that they have declared.

The reciprocal effect of tourism and the environment

The reciprocal effect of tourism and the environment depends on the numbers of tourists who travel to or through a specific area. Research shows that since the restoration of Latvia's independence, the number of tourists in Aglona and Jurkalne has increased, while in Jurmala and Sigulda it has decreased rapidly.

When researching the reciprocal effects of tourism and the environment, it is important to find out whether the development of tourism and the number of visitors create a sense of discomfort for local residents and/or for tourists. Surveys of local residents in 300 popular tourist cities and parishes in Latvia show that at the end of the 1990s the respective local governments have developed favorable attitudes toward tourists and tourism. Asked whether a rapid increase in the number of tourists might change attitudes toward tourism, more than 40% of respondents in all of the surveyed tourism development locations except for Aglona responded "No" (Figure 2). This shows that local residents do not see the development of tourism as a threat against their life rhythms and styles. The results of the survey show that in Sigulda, where tourism has had a historical and durable significance in terms of the city's economy, local residents have the most positive attitudes.

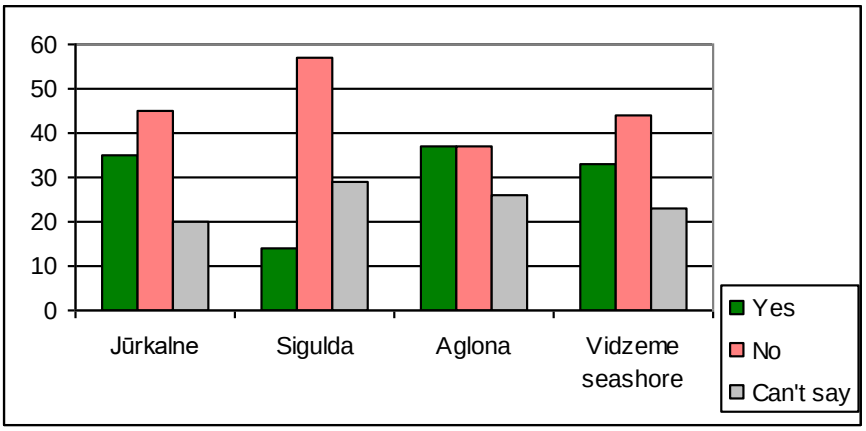

Figure 2. The responses of residents (%) to the question "Would a rapid increase in the number of tourists change your attitude toward tourism?"

It is interesting that the most reticent in terms of evaluating the inflow of tourists are the residents of Aglona. This is because the flow of tourists in the region has increased very rapidly in the last ten years; therefore, residents are hesitant when it comes to approving the increase in the number of tourists. A majority of residents in Jurkalne, Sigulda, Aglona and the Vidzeme seashore currently believe that tourists do not hamper the lives of local residents (Figure 3). It is necessary to note, however, that 20% of the residents of the Vidzeme seashore feel that tourists disturb local residents. That is because in this area we have seen conflicts among landowners, pursuers of leisure activities, and tourists. Local residents are used to a more reserved lifestyle.

More than 80% of residents in the sample territories feel that local governments should promote tourism development (Figure 4). Conversely, more than 10% of the residents of Aglona, Sigulda and the Vidzeme seashore feel that their local governments should not promote tourism development, or even that they should limit the number of incoming tourists.

Survey results show that in those areas of Latvia which are centers of tourism development, residents have a high tolerance, and tourism does not at this time create any feelings of discomfort among them.

In Latvia at this time, tourism development is not progressing sufficiently quickly to make the lifestyles of local resident's change in any significant way or to cause local identities to disappear. This is seen in the responses to questions in which residents stated that tourists do not disturb the lives of local inhabitants.

At the same time, however, a reduction in the capacity of the social and cultural environment of tourist environments is signaled by the presence in cities and at roadsides of

advertising that is more vivid than has been traditional in the Latvian cultural environment. For example, efforts to attract tourists have included the painting of roadside buildings in bright colors that are by no means typical of the various regions of Latvia.

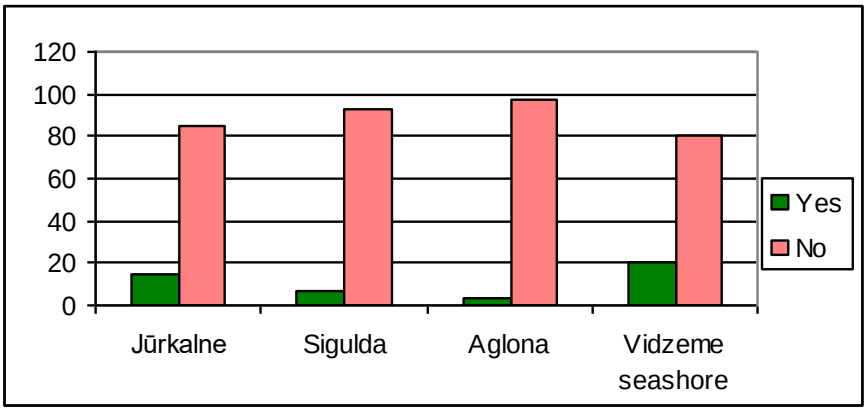

Figure 3. The responses of residents (%) to the question "Do you feel that tourists disturb the lives of local residents?"

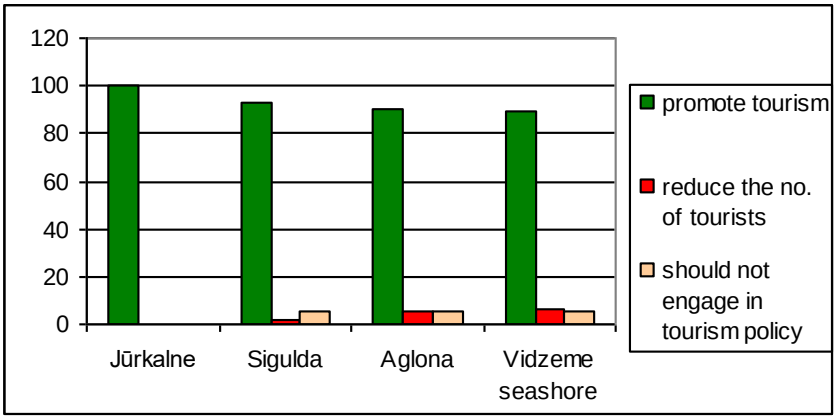

Figure 4. The responses of residents (%) to the question "In your view, what should be local government policy vis-à-vis tourism?"

If we study the effects of tourism on the quality of natural environments, it is very difficult to separate tourism from other economic activities that lead to changes in the environment. In the 1990s, declines in industrial and agricultural output have led to improvements in environmental quality. Also of positive effect has been the closing of many tourism service objects or otherwise a reduction in the number of activities that these perform. In the studied sample territories, nearly all environmental quality indicators have improved. Thus, for example, in the Gauja River at Sigulda, according to the Latvian Meteorological Board, the volume of suspended substances that usually serve to indicate the pollution caused by tourists has declined significantly (Figure 5). The tendency for these substances to decrease in volume is shown not only by the overall level of suspended substances in the river, but also by the difference in water quality upstream and downstream from the city. We can therefore assume that the rapid decline in the number of tourists and the closing of hotels has been a key prerequisite for improving the quality of water in the Gauja River downstream from Sigulda.

Another indicator of improvement in environmental conditions is found in National Environmental Health Center data about the quality of water at swimming areas in Jurmala. The installation of sewage treatment facilities in the city of Riga and the decline in the number of

tourists has led to decreased microbiological pollution in the water. This is seen in the fact that the volume of *E.coli* bacteria at Jurmala beaches was 3.3 thousand/l in 1989 but just 0.6 thousand/l in 1994.

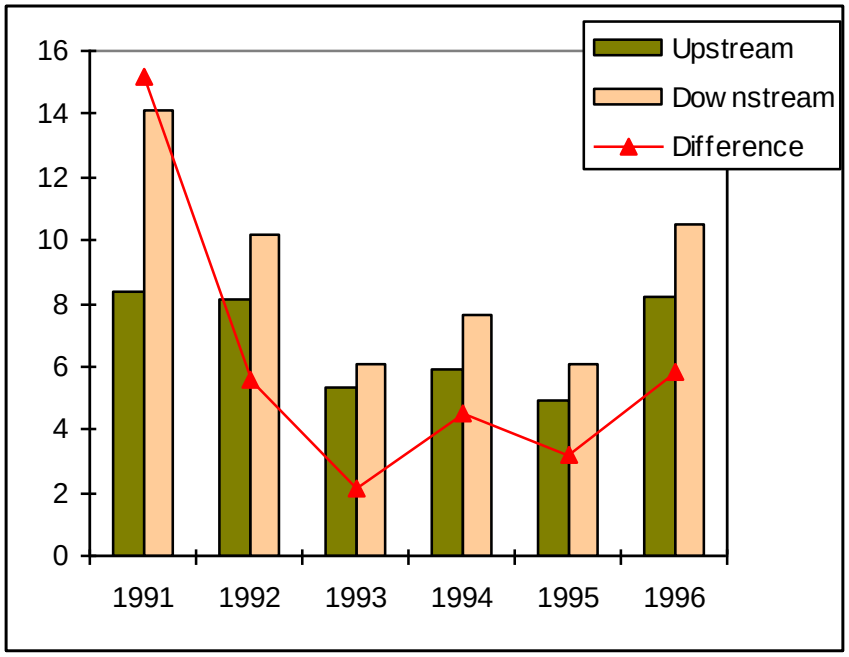

Figure 5. The volume of suspended substances (mg/l) in the Gauja River at Sigulda (data from the Latvian Meteorological Board).

The placement of fixed monitoring facilities to measure the quality of the air and water is usually not in accordance with major centers of tourism activities. For that reason, the results of measurements taken at fixed facilities must be supplemented with data from specialized research that takes advantage of various methods that are traditional in the study of ecosystems. Good results for determining air pollution indicators in tourism territories can be achieved by applying bio-indication methods. In the city of Jurmala, which is 2.5 kilometers wide and 32 kilometers long, there is only one fixed air pollution monitoring facility. Hotels and spas, however, are distributed quite evenly across the entire territory. There are 55 boiler rooms in the city, for example. This means that a single monitoring facility simply cannot help in evaluating the effect of tourism objects on air quality. In order to find out the effect of specific sources of pollution, we used *Pleurozium schreberi* moss, the bark of pine trees, and various soil samples – all of which are good absorbers of pollution. The presence of heavy metals in considerable concentrations in these substances showed that pollution is coming from specific sources of pollution – boiler rooms and motor vehicles. Thus, for example, an increased concentration of vanadium was found in moss growing near the boiler rooms of hotels and health spas that used liquid heating fuel. By merging indicators from fixed monitoring facilities and indicators obtained from various bio-indication methods, we can determine the pollution that is caused by tourism objects and the spread of that pollution.

Various methods that have been used in Latvia to come up with indicators indicating the status of the environment show that in the 1990s, tourism-related pressures against the environment have retreated; still, one of the most important tasks in promoting tourism development at this time is prohibiting any worsening in the environmental quality. Indeed, environmental quality is a key condition in tourism development.

Conclusions

1. Local governments in Latvia are not well informed about the principles of good tourism practice or about overall European Union policies in this area.
2. Local governments are using only territorial planning as an instrument of good practice, and environmental protection institutions are creating environmental protection plans for those natural territories that are under special protection. The territorial plans that have been established contain good tourism practice principles at the conceptual level, but in implementing territorial plans, some local governments have retreated from the principles that they have declared.
3. The least attention in Latvian local governments is devoted to the creation of environmental policies, to the utilization of economic and tourism industry resources, and to the introduction of ongoing monitoring systems. Most local governments have not created a tourism development strategy.
4. In the 1990s, because of a decline in the flow of tourists, we have seen a reduction in the pressures that tourists put on the environment; one result has been improved water quality in rivers and in the Bay of Riga.
5. At this time the majority of Latvia's residents evaluate tourism development positively, which suggests a high psychological tolerance among residents.
6. In order to learn more about the pressures that tourists put on the environment, there must be not only traditional environmental quality monitoring methods, but also bio-indication methods that supplement the traditional methods by allowing us to discover not only the effect, but also the response reaction of the environment.

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Geography in Latvia Between the Congresses (1996 – 2000)

Jāzeps Jankevics

Trends in research

On 5-6 December 1996 the first Latvian Geographical Congress was held in Riga. It was opened by a report on priorities of geographical research today, given by Ādolfs Krauklis, President of the Latvian Geographical Society. Vice-president of the Latvian Academy of Sciences Jānis Stradiņš spoke of Latvia as a part of Europe, and Rihards Kondratovičs, Vice-rector of the University of Latvia, considered in retrospect the development of geography in that institution of higher education. Further a symposium *Geography in School* under the guidance of Zinaīda Melbārde and a discussion *Geographical Education and Career Possibilities in Other Fields* under the guidance of Juris Paiders took place. The first day of the congress ended with an informal meeting, which was devoted to the first Latvian Polar Expedition to Spitsbergen.

On the second day the following sessions took place:

- *Biogeography and Landscape Science*, chaired by Māris Laiviņš;
- *Climate and Water*, chaired by Ansis Zīverts;
- *Environment and Geography*, chaired by Māris Kļaviņš;
- *Social Geography and Planning*, chaired by Pēteris Šķiņķis;
- *Economic Geography*, chaired by Andris Bauls and Jāzeps Jankevics;
- *Thematic Cartography*, chaired by Jānis Štrauhmanis.

The final part of the congress included a general meeting of Latvian Geographical Society, a lecture on legal, financial and regional peculiarities of the land reform in Latvia, given by Anna Seile, MP, and the concluding session.

Geographical science in Latvia is carried out in the University of Latvia, Faculty of Geography and Earth Sciences, and in the Latvian Geographical Society.

Professors in Natural Geography Ā. Krauklis, A. Melluma, M. Laiviņš and O. Nikodemuss have significantly contributed to research, protection and use of Latvia's natural and cultural landscapes. They have developed methods of land evaluation, regional planning and environmental monitoring. Natural geographers have created several projects on territorial planning and planning of environmental protection and management (Kuldiga district, Taurene and Dzerbene parishes). Of particular importance are classification, mapping and assessment of landscape units grounded in ecological, visual and cultural values, as well as those factors which decrease the landscape's value.

Dr. O. Nikodemuss has studied the chemical pollution of soils with heavy metals and its influence on vegetation. Professor M. Laiviņš has investigated plant communities and organic substances produced by vegetation, as well indicators and causes of ecosystem change.

Interaction of global, regional and local factors in the geographical systems of European boreo-nemoral ecotone is a subject of the basic research carried out by Ā. Krauklis. He has examined heaths in the landscapes of Britain and Latvia by doing fieldwork in different sites of Latvia, England, Scotland and Wales. In the frame of applied geography, he has launched the project *Landscape Perception and Land Use Management*. The project is aimed at equally wide involvement of different specialists and local people in performing land evaluation, land use planning and the development of cultural landscapes.

During the last ten years Professor M. Kļaviņš has studied the changes in chemical composition of surface waters and the factors causing these changes. He has explored humic substances in soils, peat and inland waters, and the features of these substances depending on their origin. Professor Kļaviņš has analyzed environmental changes under the influence of human and natural factors. He has developed a typology of Latvia's lakes.

For almost fifteen years Professor G. Eberhards and M.geogr. B. Saltupe have been carrying out the study of the dynamics of the current Baltic Sea coastal processes, particularly the movement of sand masses on beaches and the recession of abrasion slopes. Considering the disastrous increase in beach erosion at Jurmala, monitoring of the coastal zone is organized at many profile sites. The results obtained have contributed to the development of coastal change forecasts, as well as in defining risk zones and assessing the eventual losses.

In the broad research area of glacial geology and geomorphology, Professors O. Āboltiņš and V. Zelčs, Docent I. Strautnieks and M.geogr. A. Markots are pursuing investigations of glacial landforms, their disposition and structural peculiarities, as well as the elucidation of glaciers' degradation courses and conditions. A detailed division of Latvia's territory into geomorphologic districts has been carried out.

The Regional Study Center of the University of Latvia under the leadership of Dr. P. Šķiņķis has contributed to the concept of regional policy in Latvia. Research methods have been developed for the consolidation of local authorities and the investigation of population behavior and social-geographical structure in the parishes of Taurene, Dzerbene, Vecpiebalga and Jaunpils for the purpose of further administrative territorial reform. A. Melluma has studied Latvia's towns in the context of regional development and has developed a classification for them.

Docents of Human Geography A. Bauls, J. Jankevics, M. Kasparovica, Z. Krišjāne and M. Rozīte deal with investigations of population and settlements in Latvia and study changes in the spatial structure of urban areas caused by the transition to a market economy. Based on the information obtained from questionnaires, Z. Krišjāne, A. Bauls and J. Jankevics have worked out criteria and indicators of big city gravitation areas in Latvia. This research is a contribution to working out the National Plan for Sustainable Development of Settlements' and Towns' Network.

Dr. Z. Krišjāne and Dr. A. Bauls are currently also participating in the project *Social, Economic and Political Factors of Population Migration in the Former USSR Republics*, run by the Russian Academy of Science.

Dr. M. Rozīte has studied the trends in tourism development in Latvia and Riga through questionnaires, national statistics, and interviews with pertinent parties. The work has indicated how tourism might be extended as a branch of the economy to replace lost industrial capacitates. A wide variety of practical strategies have been suggested by the research.

Dr. P. Eglīte of the Institute of Economics in the Latvian Academy of Sciences has carried out long-term qualitative and quantitative studies of human potential in Latvia, with special attention to human reproduction. She has contributed to the development of draft laws on employment and social protection by investigating the interplay of the demand for a quality labor force, education levels, age variation and child rearing.

A number of geographers deal with toponymic research: Dr. Z. Goba, O. Kovaļevska, V. Strautniece, J. Kavacis, Dr. R. Zvejnieks. Toponymy lies on the border of three disciplines – geography, linguistics and history. Seven dictionaries of place names have been compiled at the Scientific Laboratory of Regional Geography and Toponymy, the University of Latvia. Three of them are the dictionaries of Latvia's hydronyms; the remainder are dictionaries of place names in separate districts (Riga, Valka, Kuldiga and Kraslava). There is an urgent need for a normative national toponymic dictionary, comprising toponyms of the whole territory of Latvia. Compilation of this dictionary should be connected with the preparation of Latvia's topographic map at the scale 1 : 50 000.

Professor V. Zelčs and I. Grīne have compiled and published the *Illustrative Latvian-English-German-Russian Dictionary of Geomorphologic Terms* (1997), and I. Ancāne the *Interpretive Dictionary of Natural Geography* (2000). Dr. J. Štrauhmanis, J. Turlajs, G. Milliņš, R. Krūmiņš and D. Zommere have worked in cartography. Maps of Latvia's districts and towns and school atlases are published by the publishing house *Jāņa sēta*. In their turn, J. Jankevics, Z. Melbārde, M. Rozīte, A. Lipsberga, A. Biseniece, B. Brice, A. Rudovics and T. Rudovica have been responsible for the creation, development and publication of geography textbooks for elementary schools and general education schools.

Conferred degrees and honorary titles

Eight Doctoral and one Doctor habil. dissertations have been successfully completed at the Faculty of Geography and Earth Sciences from 1996 to 2000.

Doctoral dissertations:

- O. Nikodemuss: Geochemical Indication of Environmental Pollution in Latvia, 1996;
- A. Briede: Phosphorus and Heavy Metal Accumulation in Water Bodies of Latvia,1996;
- Z. Goba: Dictionaries of the Place Names of Latvia, 1997;
- Z. Krišjāne: Research of Spatial Differences in Quality of Life in Latvia, 1998;
- I. Markausa: Distribution of Population in Latvia and Its Eventual Changes, 1998;
- E. Apsīte: The Flow of Organic Matter in Surface Waters of Latvia and Sweden under Variable Anthropogenic Impact, 1999;
- M. Rozīte: Urban Tourism, Its Development and Spatial Structure in Riga, 1999;
- P. Šķiņķis: Territories and Territorial Strategies in Latvia, 1999.

Doctor. habil. dissertation:

- M. Laiviņš: Synantrophization and Eutrophication of the Boreal Pine Forests in Latvia, 1998.

In 2000, Professor M. Kļaviņš was elected a full member of the Latvian Academy of Science. In 1998, Professor Ā. Krauklis was awarded the Golden Medal of the Faculty of Science, Charles University, Prague for his contribution to landscape ecology. In 1999, Professor Ā. Krauklis was elected a member of the Deutsche Akademie der Naturforscher Leopoldina.

Scientific events, conferences

Latvian geographers participated at the 28 International Congress of Geographers in The Hague on 4-10 August 1996. They gave three reports:

- Ā. Krauklis: Contribution of Landscape Research in the Development of Geographical Thought;
- Z. Krišjāne: Assessment of Environment and Health in Latvia;
- M. Rozīte: Sustainable Tourism − the Possible Way of Development of Latvia's Tourism.

In 1997, the workshop *Conflicts of Minorities and Intercultural Competence* was held in Riga with excursions to Valka, Valga, Daugavpils, Subate and Jelgava. Scientists from Germany, Latvia, Russia, Estonia, Austria and The Netherlands were among the participants. The workshop was supported by the Volkswagen Fund, and was organized by the Institute of Geography University Hanover, the Institute of Regional Geography Leipzig and the Latvian Geographical Society.

In 1997, the international symposium *Vegetation, Landscape Change and Nature Protection* was organized in commemoration of the 125th anniversary of the birth of Professor K.R. Kupfer and the 85th anniversary of establishing the first Latvian nature reserve Moricsala. It was held jointly with the Botanical Society of Latvia, the University of Latvia, the Goethe Institut Riga and several other Latvian and foreign institutions. Representatives from Latvia, Finland, Germany, Denmark and Sweden participated in this event.

In 1998, a regional conference entitled *Geographical Education and Regional Development* was arranged by the Latvian Geographical Society in cooperation with the Vidzeme College in Valmiera. Four thematic sessions were held: (1) school, geography and development; (2) education; (3) nature research; (4) places and place names. The conference ended with an excursion in Valmiera and a performance in the Valmiera Theater.

Home Area Study and Geography was the topic of a scientific event organized by the Latvian Geographical Society, the Vecpiebalga Secondary School and the Institute of Regional Geography Leipzig in 1998 in rural Vecpiebalga. Both secondary students and scientists discussed results of their investigations of people, land and nature in the region to promote the active involvement of the local population in developmental planning, environmental protection and the development of landscapes. Especially encouraging was an exposition on the research accomplished by the students, an excursion that included visits to a biodynamic farm, traditional

and modern homesteads and some rural museums, as well as a survey of several biotops and landscapes.

Institutions

Geographers in Latvia are primarily taught at the University of Latvia, Faculty of Geography and Earth Sciences. There are three Departments in the Faculty of Geography and Earth Sciences.

Number of Students on 1 April 2000

Department	*Bachelor Program*	*Master Program*
Geography	164	86
Environmental science	130	39
Geology	57	17
Total	351	142

Geography is also taught at Daugavpils Pedagogic University.

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