1988 changes in pine and spruce annual radial increment stabilized at the level of 1980-1982, while in 1989-1995 a tendency of recovery and decreasing increment losses is observed. It was a result of essential reduction of environmental pollution. Studies on drainage efficiency of permanently overmoisted and marshy forests have indicated that tree annual radial increment augmentation after drainage is rather dependant on climatic conditions at the time of draining. In the case of drainage of *Pinetum myrtillo-sphagnosum* and *Pinetum carecoso-sphagnosum* forests as well as *Pinetum carecoso-calamagrosticosum* and *Pinetum calamagrosticosum* forests at the beginning of dry period, forest stand adaptation to ground water level changes is shorted. This led to tree annual radial increment augmentation already in the first 5-year period after drainage, while the greatest increment effect was attained in the second and third period after drainage. Later drainage effect was decreasing and after 25-30 years has disappeared, while tree annual radial increment corresponded to the increment of control (undrained) stands). Drainage in rainy period caused the significantly changes in level of ground water, stand adaptation to new ecological conditions takes longer time and tree growth increase is achieved 2-3 years later, as compared to drainage in dry period. It is more rational to drain pine and spruce forests growing on permanently overmoistured and marshy habitats at the beginning of dry periods, because then climatic conditions are more favourable for radial growth. Drainage of black alder forests is inefficient: insignificant radial increment rise is observed in young drained *Alnetum carecosum* and *Alnetum carecoso-calamagrosticosum* forests. Their radial increment is slightly higher in the 3-5 five-year periods, later it does not differ from the increment of undrained forests; in older drained black alder forests negative drainage effect was ascertained, expressed by tree annual radial increment decrease.
Results of dendrochronological studies on tree annual radial increment changes due to fertilization, carried out in 50-year- old pine forests in the vicinity of "Akmenės cementas" indicate, that annual radial increment of trees fertilised by different mineral fertilisers increased as follows. Having fertilized by carbamide (80 kg/ha of nitrogen active substance), pine annual radial increment in the first year after treatment augmented by 20%, in later years it differed from the control by 10-15%. The greatest fertilization effect according to additional annual radial increment was ascertained after treatment with superphosphate (100 kg/ha of phosphorus active substance) in the 2nd and 4th year after fertilisation, when pine annual radial increment augmented respectively by 46% and 30%, compared to control; positive effect of superphosphate was revealed in dry 1992 and 1994 years, when pine annual radial increment augmented by 46% and 30%. The greatest effect of fertilization by double phosphogypsum dose (10 t/ha) – increment rise by 39-47%, compared to the control. Having fertilized with 5 t/ha of phosphogypsum, pine annual radial increment has grown by 11-30%, while with a mixture of phosphogypsum (5 t/ha) and superphosphate (100 kg/ha of phosphorus) – by 18-23%, compared to the control.

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[P] Growth and condition of Scots pine (*Pinus sylvestris* L.) forests in urban and industrial environment

Kaunas city is covered by Scots pine (*Pinus sylvestris* L.) forests. Urban environment is affected by various environmental factors, including air, soil pollution, soil pressure, land use activities, excavation and trenching, mechanical tree damages. Conifers are especially sensitive to environmental pollution. Annual radial increment can be

used as an anatomical indicator for assessment of climatic and anthropogenic impact.

310 sample Scots pine trees for radial growth and morphological tree crown indicators (crown defoliation, foliage discoloration, the amount of dead branches, state of tops, needle retention, fruiting and damages) analysis were assessed in 17 sample plots distributed in Kaunas city forest parks.

Maximum values of annual increment were detected in 1936-1938, 1947-1950, 1965-1967, 1974-1976, 1983-1985, 2001, which corresponded to warm favourable for growth periods. Minimum increment values were detected in cold periods of 1930, 1940-1943, 1956-1958, 1978-1979 and droughts in 1992, 1994, 1996 and 2002. The tendency of annual tree growth decrease since 1992 until 1996 was observed. In 1998-2001 radial growth have increased again. The most intensive radial growth of 50–69 years-old trees in 2001-2003 was estimated in "Botanical Garden", the smallest – in "Lampėdžiai" sample plots. The largest increment of the 70-89 years-old trees was estimated in "Petrašiūnai-2" site, the smallest – in "Palemonas-1". The largest increment in "Panemunė-2" location and the smallest in "Raudondvaris-2" site were estimated in the 90-120 years-old trees. Crown defoliation data showed the best pine trees condition in "Botanical Garden" site and the worst condition in "Panemunė-1", "Palemonas", "Raudondvaris-2" and "Vičiūnai" sites. Average crown defoliation in 2001-2003 of Kaunas city Scots pine forests was 25.88±3.6%. Rising emissions from mobile pollution sources contributed to this worsening tendency. The reliable (P=0.95) improvement (compared to 1998 data – 32.5±2.0%) of pine forest condition in Kaunas city was established. The worst pine condition was observed in the most polluted Kaunas city districts (Palemonas, Panemune and Petrašiūnai), in the vicinity of high-ways ("Kleboniškis-1" sample plot) and in locations of intensive recreation activities ("Eiguliai" and "Petrašiūnai-2" sample plots). Only symptoms of foliage discoloration in "Kleboniškis-1" sample plot situated nearby Vilnius-Kaunas highway were noticed. The lowest amount of dead branches has been estimated for Scots pines growing in "Botanical Garden", "Pažaislis" and "Kleboniškis-2", the highest one – in "Raudondvaris-2" sample plot (26.5±2.3%), where the oldest pines were observed. More than 15% of dead branches in Scots pine crowns were detected in "Kleboniškis-1", "Palemonas-2", "Petrašiūnai-1" and "Vičiūnai" sample plots. The standard retention of Scots pine needles that indicates an optimal tree growth conditions in Lithuanian forests is 4 years. The longest age of pine needles (3.1±0.03 years) was estimated in "Botanical Garden", "Kleboniškis-2", "Pažaislis" and "Romainiai" sample plots. The shortest (1.9±0.04 years) needle retention was estimated in "Kleboniškis-1", "Palemonas", "Panemunė", "Petrašiūnai-1", "Raudondvaris-2" and "Vičiūnai" sample plots.

Tree ring data of 12 Scots pine stands (280 sample trees) growing 3.5-5.0 km away from the cement plant "Akmenes cementas" in the direction of prevailing, non-prevailing winds and control were used for the indication of annual radial increment response to industrial pollution impact. The analysis of annual radial increment dynamic have indicated, that during period of moderate pollution (1955-1974) the annual radial increment of sample trees growing in the direction of prevalent winds came to 85-90% from control. In period of heavy pollution (1975-1988) due to great amounts of plant emissions annual radial increment have decreased by 40-45% from control. Since 1995 till 2003, due to the decrease of plant emissions, annual radial increment of pines was only 10-15% lower than control. The impact of plant emissions on the pine stands growing in the direction of non-prevalent winds is low. It was ascertained that cold and rainy periods strengthened negative impact of pollution: annual radial increment decreased by 10-12% from control during these periods. Due to decrease of plant emissions in 1995-2003

annual radial increment was only 7% lower than control.

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[P] The identification of wood origin in the light of new dendrochronological standards

Common usage of oak and, to a lesser degree, pine timber as materials for construction and transport utilities had led to its deficiency already in Middle Ages. Owing to that, wood became a subject of the large-distance trade. Exportation of timber from Poland commenced in the thirteenth century and in a relatively short period of time timber trade developed in the whole of the Vistula river basin, up to Cracow and Przemyśl. Timber delivered to the Baltic harbours was partly used for local purposes as well.
In the last years, thanks to development of a net of Polish local and regional chronologies, it became possible to identify the origin of wood. Some years ago it was NE Poland that was dendrochronologically a relatively poorly recognised terrain. Therefore, with the aim of filling the gap, timbers from that region were gathered in the laboratories of UMK in Toruń and AGH in Cracow. Currently the collected material enabled construction of regional chronologies for pine and oak spanning almost whole of the last millennium. Newly established pine chronologies cover the periods: 1168 - 2000 for the Kujawy-Pomerania region, and 1081 - 1408 AD and 1410 - 2003 AD for the Mazury and Suwałki Pomerania. Two regional oak standards were produced for the Toruń region (1060 – 1665 AD) and for the Mazury and Suwałki Pomerania (1093 - 1665 AD and 1695 - 2003 AD). This completion of the existing net of local and regional chronologies in practice permits for effective determination of the origin of Polish timbers. As good examples may be presented analyses of wood from archaeological sites and old buildings from Toruń and Gdańsk, especially from the Green Gate in Gdańsk, where the encountered timbers proved to have been of local origin as well as brought from southern, central, and north-eastern Poland. The study was performed as a part of the AGH WGGiOŚ research project no 11.11.140.917.

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[P] A drought sensitive low elevation network for the Alps

The Greater Alpine Region (GAR) provides a great resource in terms of length and spatial density of climate data. Although much work has been done, the potential of these data has not been exploited adequately and systematically. By collecting and homogenizing a huge amount of instrumental and proxy data, the EU-project ALPIMP (multi-centennial climate variability in the Alps based on instrumental data, model simulations and proxy data; co-ordinator: R. Böhm/Vienna) aims to draw a consistent and detailed picture of local to wider-regional climate variability in the region on decadal to multi-centennial time scales and along elevational gradients. Within this framework a tree ring network of dense spatial and extensive temporal resolution has been established. Investigations from selected high elevation sites have yielded detailed local and wider regional temperature reconstructions on annual to multi-decadal time scales (Frank & Epser 2004). Moreover we focussed on the development and analyses of millennial length composite chronologies (recent and historical material), with sufficient sample replication for the application of age-related