

## COOPERATION FOR A GREEN FUTURE

### **Annotated bibliography of studies related to lead pollution in Georgia**

(updated 24 January 2007)

Mindorashvili, A. 2006. *Quality evaluation of environmental issues in Georgia and some related social problems*. Georgian Strategic Research and Development Centre, Bulletin No. 100. (in Georgian language)

This publication presents lead monitoring data from 2004-2005 in central Tbilisi. The lead concentration in the air was 1.5-1.7 times higher than the country's legal standard of 0.0003 mg/m<sup>3</sup>. The lead concentration in the soil in the city center area was 1.0-1.3 times the legal standard of 32.0 mg/kg. An analysis of lead level in human hair among Tbilisi residents showed a much higher lead level among population groups that are more heavily exposed to vehicle emission (e.g. street vendors and people residing along major avenues), suggesting that vehicle exhaust is a major source of lead exposure.

Tkhilava, N. and Karanadze, L. 2006. *Transport Related Air Pollution and its Negative Health Effects in Tbilisi*. Report of the Ministry of Environment Protection and Natural Resources of Georgia. (in Georgian language)

This report describes the rationale for, and progress made toward, a phase-out of leaded gasoline in Georgia. Since 1999 the maximum permitted level of lead in petrol is 0.013 grams per liter. Legislation was passed in 2000 defining a reduced maximum allowable lead concentration of 5 mg/liter by 2005, but that was later delayed until 2007 due to difficulties with enforcement and possible negative social factors such as increased prices of products and services.

Vashakmadze, N. 2006. *Influence of vehicle exhaust on Tbilisi atmospheric air pollution, and perspectives on minimizing pollution level by improving gasoline quality*. Environmental Protection Scientific Research Institute, Georgian Ministry of Environmental Protection and Natural Resources. (in Georgian language)

This dissertation work focused on the potential to reduce the atmospheric air pollution in Tbilisi by increasing gasoline quality by using clinoptilolite zeolite in the hydrogenised form. This appeared effective at increasing the gasoline octane number in gasoline produced at Georgian oil refinery, caused by decreasing paraffin amount. In this study the lead from exhaust gas was checked.

Ogbaidze, S. 2005. *Heavy metals air pollution monitoring and study of meteorological conditions and ecological safety provision in the Tbilisi-Rustavi air basin*. Georgian Technical University, Tbilisi. (in Georgian language)

Air quality monitoring was carried out in 15 different places in the Tbilisi air basin from 1995 through 2003. Levels of Pb, Mn, Cr, Ni, and Fe were investigated. Lead concentration reached maximum in the fall and beginning of winter. The minimum is in summer, which is the result of reduced transport in summer. The lead concentration was 13.8 times higher than legal limit in 1995. It increased in the following years and in 2002/3 reached 22.5-24.0 higher than the limit.

Kurkjian, R., Dunlap, C. and Flegel, A.R. 2004. *Long-range downstream effects of urban runoff and acid mine drainage in the Debed Riber, Armenia: insights from lead isotope modeling*. Applied Geochemistry, 19: 1567-1580.

This study examined lead concentrations along the Debed River in Armenia, up to the point where the river leaves Armenia and enters Georgia on its way to the Caspian Sea. The river water entering Georgia has a fairly stable lead concentration of 2.8 µg/liter, corresponding to a total annual flux of 2500 kg/year. Isotope analysis indicates that 46% of the lead flux originates gasoline lead runoff from the Vanadzor urban area, and 54% is from acid mine drainage from the Alaverdi mining district.

Clench-Aas, J., Juruli, M., and Arnesen, K. 2000. *Blood lead concentrations in the population of Tbilisi, Georgia: results of model estimates*. Report NILU:OR 43/2000, Norwegian Institute for Air Research, Kjeller, Norway.

This study used a compartment model to estimate anticipated reductions in blood lead concentrations due to proposed gasoline lead restrictions in Georgia. It compared the estimated blood concentrations in 2000 when gasoline lead was 50 mg/liter, with estimated blood concentrations that would exist at the target gasoline lead level of 13 mg/liter and at a “worst case” scenario of 80 mg/liter gasoline level. This study only presents modeling results; no samples of actual blood concentration were analyzed.

Norwegian Consortium for Energy and Environment (NORCE) and Ministry of Environment of Georgia. 2000. *Country Programme for Phasing Out of Lead in Gasoline in Georgia; Volume 1: Assessment of the Existing Situation and Development of Baselines*. Report GEO-2110. V.1

This study analyzed the lead level of fifty samples of gasoline taken from different gasoline stations in the city of Tbilisi between December 1999 and February 2000. The lead content varied significantly from <2.5 mg/liter to a maximum of 550 mg/liter. The weighted average lead content of the gasoline sold at the time was calculated at 52 mg lead/liter gasoline. The study discussed various technical measures for phasing out leaded gasoline.

Norwegian Consortium for Energy and Environment (NORCE) and Ministry of Environment of Georgia. 2000. *Country Programme for Phasing Out of Lead in Gasoline in Georgia; Volume 2: Options for Policies and Measures for Implementing Lead Phase Out in Georgia*. Report GEO-2110. V.2

This publication discussed a variety of policy measures for phasing out leaded gasoline in Georgia, building upon the technical analysis presented in Volume 1. Issues discussed in this study included economic considerations, factors in designing effective implementation measures, challenges to the successful implementation of a phase-out policy, organizational and institutional issues, and the legal context.

Anon. 2000. *Eliminating consumption of ethylized fuel: analysis and future plans*. Georgian Ministry of Environmental Protection and Natural Resources, Tbilisi. (in Georgian language)

This study described the project “Tbilisi atmospheric conditions evaluation” carried out in 2000, financed by the EU Environmental Protection Directorate. This indicated that 40% of Tbilisi city’s autos are 10-15 years old, and about 20% are more than 15 years old. Most of the cars are Soviet cars without catalytic converters to reduce exhaust gas emission. Numbers of foreign cars having catalytic converters is growing in Tbilisi, but because they use leaded gasoline the converters lose their function resulting in increased exhaust gas emission. In Tbilisi the average atmospheric lead level is around 0.08-0.09 mg/m<sup>3</sup>, while the standard (average lead level over 24 hours) is 0.0001 mg/m<sup>3</sup>. The lead level in the Mtkvari river basin in Tbilisi region is very high, about 2.8mg/liter, largely because of ethylated gasoline consumption.

Asanidze, L. 1999. *Dynamics of heavy metals content in citrus trees in Adjara region*. Department of Ecology, Georgian State University of Djavaxishvili, Tbilisi. (in Georgian language)

This study investigated the spatial and seasonal dynamics of heavy metals (Cd, Zn, Pb, Sn, Ti) concentrations in soil, water, air, atmospheric precipitation, and citrus tree leaves in Adjara region in southwest Georgia. There was higher amount of Pb in the air in summer, and higher amount in soil in fall. Pb content in citrus leaves was different based on which place it was growing and the time samples were taken. Pb amount in all kind of citrus increases in the fall. Pb accumulation could happen from soil through roots, also from air through leaf surface (filorul). This process is more intensive in the fall, because atmospheric precipitation increases this time and soil receives the Pb accumulated in the atmosphere from spring to summer.

Kobulia, B.G., Jashi, I.M. and Chapichadze, Z.V. 1996. Ecological aspects of dissemination of hypertension in Georgian population. Abstract in *American Journal of Health*, Vol. 9, No. 4, Part 2.

This study found a high correlation between cardiovascular morbidity (hypertension and coronary arterial disease) and environmental concentration (in soil, air and water) of heavy metals including lead, in Georgian population aged 20 to 49 years.

Gunia, G. 1985. *Issues of monitoring of environmental protection in the territory of Soviet Georgia*. (in Russian language)

This early study recognized leaded transportation fuel as an important source of pollution in Georgia. Presence of lead in gasoline existed because of use of tetraethyl lead in gasoline in concentrations from 0.001 to 0.1%. Research showed that in areas of intensive transport movement (up to 2000 vehicles per hour, with gasoline use per car of 0.11 liter/km) there is an emission of 40-60g lead per hour per kilometer of road.