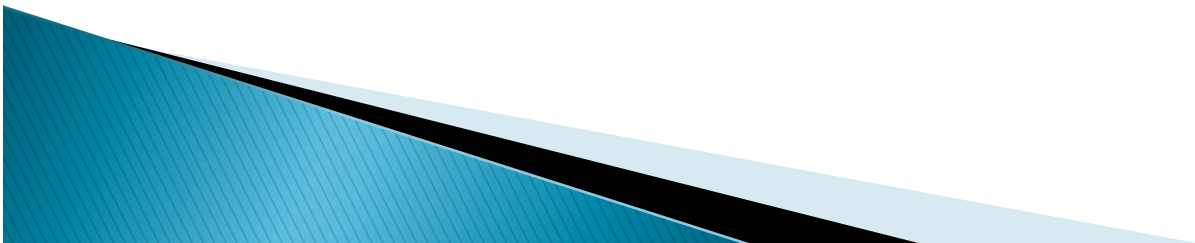
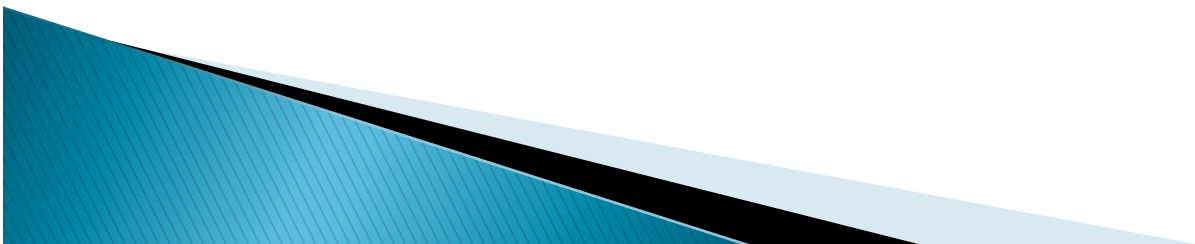


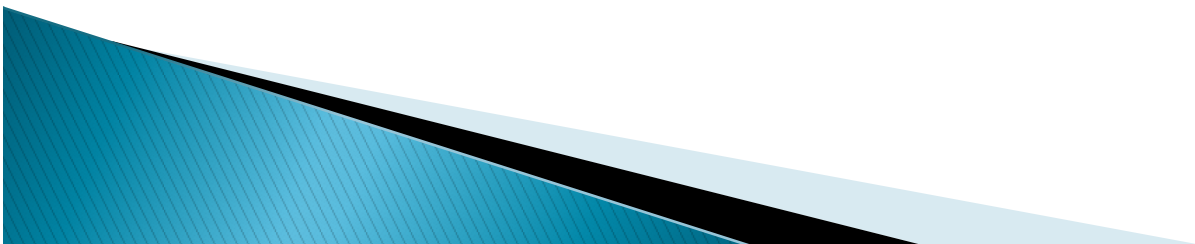
- ▶ Thus we can conclude that an abundant quantity of metals are emitted into the atmosphere from natural sources. The quantity of anthropogenic emissions of these metals is given in the next section.
- ▶ **Anthropogenic:**
- ▶ There are a multitude of anthropogenic emission in the environment . The major source of these metals is from mining and smelting .



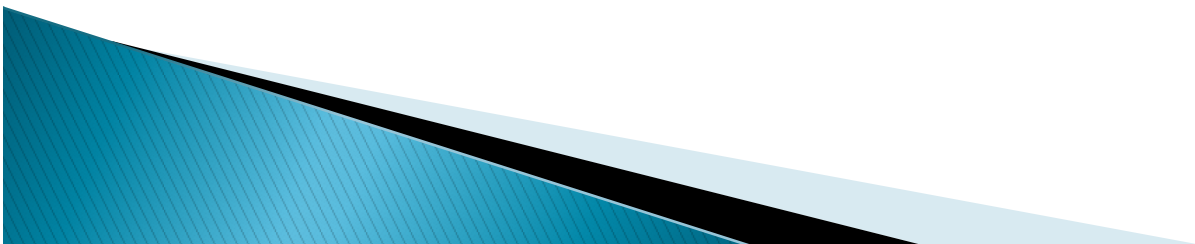
- ▶ Mining release metals to the fluvial environment as tailing to the atmosphere as metal -enriched dust whereas smelting releases metals to the atmosphere as a result of high temperature refining process .In the lead industry , Pb - Cu-Zn -Cd are released in substantial quantities ; during Cu and Ni smelting , Co -Zn-Pb-Mn as well as Cu-Ni are released ; and in the Zn industry , sizeable releases of Zn -Cd-Cu-Pb occur .



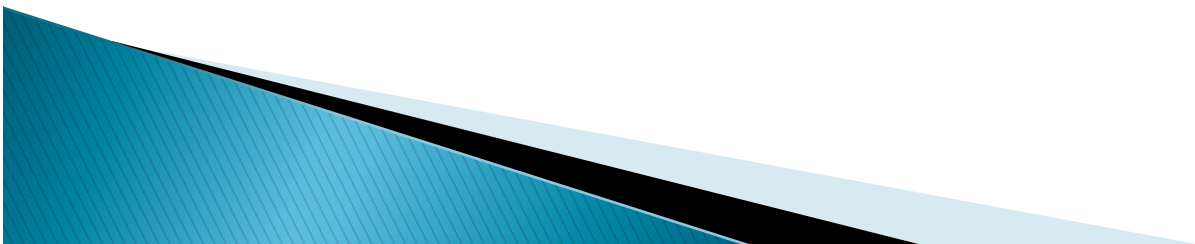
- ▶ Table 1 shows that the the world metal production during the 1970s and the 1980s has remained relatively constant except for Cr production that substantially increase during the 1980s due to the technological advances and increased importances .
- ▶ Much of the demand for Cr was due to steel and iron manufacturing and the use of Cr in pressure treated lumber .



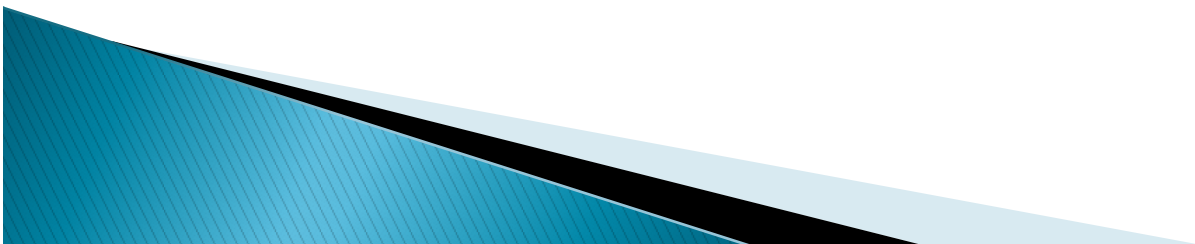
- ▶ Table 1 also shows that anthropogenic emissions to the atmosphere, to which mining and smelting are major contributors, are in the interval of two times (Cu, Ni), five times (Zn, Cd) and 33 times (Pb) greater than the natural emission of metals to the atmosphere.
- ▶ Anthropogenic atmosphere emission decreased substantially from the 1970s to 1980s for Pb, Zn and Cu.



- ▶ On the other hand, Cd and Cr have remained the same and Ni emissions have increased in 1980s . In addition , anthropogenic emissions of Cr are only about one half of those from the natural sources .The major contributors of Cr to natural atmospheric emissions is windblown dust .
- ▶ Table 2 gives a comparison of the six heavymetal contents of a variaty of natural earth materials that annually impact atmospheric, terrestrial , and aquatic environment.



- ▶ The primary data of metals are also normalized with respect to titanium (Ti). Titanium is a very conservative element that is associated with crustal rock sources , Normalization with respect with respect to Ti compensates for the relative percentage of various diluents (non- crustal rock sources) and allows one to see more clearly metal enrichment due to anthropogenic inputs.



- ▶ For instance in table 2 recent lacustrine sediment is clearly enriched in metal content relative to pre - Industrial lacustrine sediment.
- ▶ It is obvious that there is a progressive enrichment in the metal content of the earth materials as one migrates from the earth's upper crust to the soil to river mud to lacustrine sediments , and finally to the river particulate matter.

