



PROCEEDINGS BOOK

12th ICEEE-2021

“Global Environmental Development & Sustainability: Research, Engineering & Management”

November 18 – 19, 2021 RKK – Óbuda University, Budapest, Hungary

ISBN: 978-963-449-256-6

www.iceee.hu

IMPACT OF BRASSWARE UTENSILS INDUSTRY ON THE ENVIRONMENT, CONSTANTINE, NORTH-EAST OF ALGERIA

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Abstract: The traditional industry of brassware utensils localised in Constantine, north-eastern of Algeria. This industry occupies the left bank of the Rummel Valley, a work based on the transformation of copper in sheets into utilitarian or simply decorative items, using chemicals harmful to the environment discharged directly either into the sewerage network or run off on the surface to Oued Rummel, a solid and liquid sample was carried out in order to dose the degree of pollution of possible heavy metals. The results of analyses show a high percentage of heavy metal pollutants in solid and liquid samples show a Cu level that varies from 2mg/l to 3 mg/l, chromium Cr reaches 1.07 mg/l, Nickel Ni 0.81 mg/l, Lead Pb 0.13 mg/l, Cadmium Cd 1.1 and Silver Ag 0.21 mg/l. Rates that exceed all standards, Algerian, WHO, AFNOR. The lack of long-term treatment of these discharges will cause pollution of metal elements harmful to groundwater tables and cause a degradation of water resources exploited for irrigation north of the city of Constantine and which partially flow into the Beni Haroun dam that supplies the major cities of northeastern Algeria.

Keywords: Traditional industry, copper, impact, heavy metals, pollution, Constantine.

INTRODUCTION

For a long time, man's interest has been to satisfy his ever-increasing needs in terms of daily life. He has therefore turned to industry, including traditional industry, such as the copper industry (brassware), which dates back to the Middle Ages and focuses a large Turkish inspiration [4]. This traditional copper industry is renowned in Middle Eastern countries such as Syria and the Maghreb in Algeria and Morocco. In Algeria, copper manufacturers are concentrated in the Casbah, Algeria and Bardo Constantine [4], which finances the Algerian East with copper vessels (among the local products, the Mahbès, the Cafatira, the Kirouana, the M'rach and El Kettara) [4]. Despite its success in this area that has experienced great demand in the market recently, it has forgotten one, which is the effect of materials and chemicals used [3], this manufacturing process or process during the refining of copper after the completion of manufacturing that thrown into the water system or directly on the ground, which constitutes a degree of toxicity to the environment and man in the first place [7,5]. In order to help reduce pollution, we conducted a study on copper workers in the city of Bardo in Constantine to know the source and location of liquid and solid polluted discharges, and study their effects on the environment and man. And try to develop solutions and preventive measures to reduce

pollution in this city.

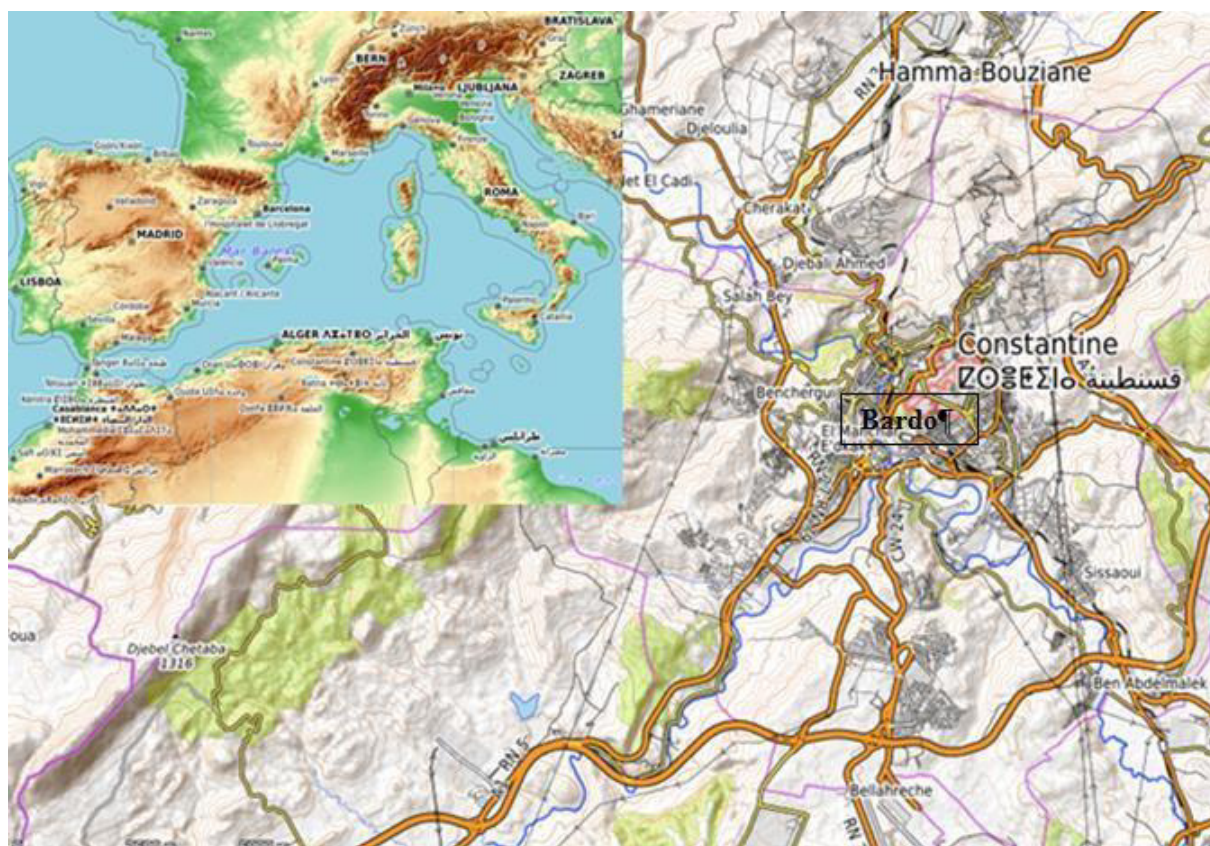


Figure 15. Location of the studied area in Constantine's city).

MATERIALS AND METHODS

For our study, we conducted field studies on the site of Bardo "Constantine", located between latitudes ($36^{\circ}22'$ and $36^{\circ}21'$ North) and longitudes ($6^{\circ}37'$ and $6^{\circ}36'$ East) [1]. Where we collected ten liquid and solid samples at different locations on the left bank of Oued el-Rummel next to the giant bridge "Salah Bey" Bardo site. The coordinates of the sampling points are recorded in a notebook. For solid samples we took by a manual auger and put it in numbered freezer bags and liquid samples were placed in glass bottles 500 ml, then place all samples in coolers with cold blocks. The scientific treatment of solid and liquid samples is done at the research laboratory of the Faculty of Science and Universe University Mentouri Constantine. Where we dried the soil samples in an oven at a temperature of 450°C for 24 hours [2, 8], then we crushed and sieved them, then we carried out The acid attack, and filtering the samples and analysing them as well as the five water samples by atomic absorption spectrometry.

RESULTS AND DISCUSSION

Atomic absorption spectrometry analyses were made for the water samples by the protocol of Rodier [8], to determine the concentration of heavy metals in the five samples. Figure 2 represents the concentration (mg/l) of the elements (Fr, Cu, Cr, Zn, Ni, Cn, Sr, Pb, Cd, As and Ag)

Iron varies between 0.01mg/l and 1.1mg/l the highest value recorded on the basin of the coppersmith's shop and which contain all the chemicals. Copper varies between 0.002mg/l and 2.1mg/l the highest value recorded on the basin of the brassware that exceeded. Chromium varies between 0.87mg/l and 1.07mg/l where we recorded the highest value in the basin of the dinanderie and the upstream of Oued Rummel which is considered as the place of discharge of liquid discharges.

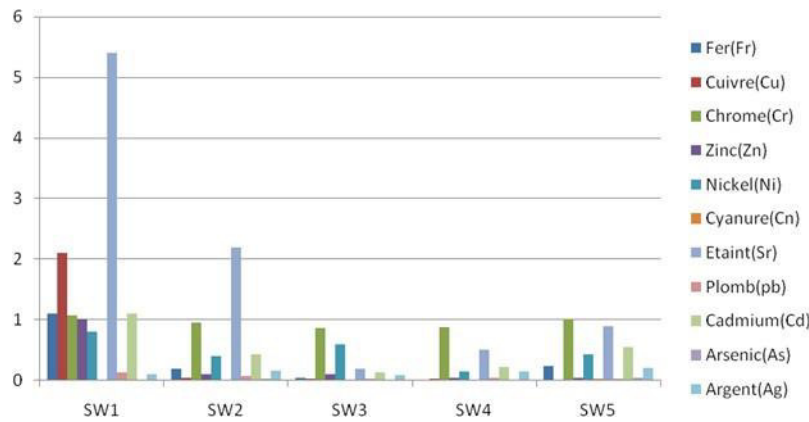


Figure 2: the concentration (mg/l) of heavy metals in the five water samples.

SW1: water sample from the basin of the dinanderie, SW2: sample water from the downstream of Oued Rummel
 SW3: sample of spring water on the side of the Oued, SW4: sample water of Bardo sewerage network
 SW5: sample water from upstream of Oued Rummel

Zinc ranged between 0.04mg/l and 1.01mg/l, the highest value recorded in the basin of the dinanderie. Nickel varied between 0.15mg/l and 0.81mg/l where we recorded high values in all the samples and exceeded the norms because nickel baths are used in the rinsing stage in the coppersmith's shop [7,3]. Cyanide varied between 0.001mg/l and 0.02mg/l and did not exceed the standards. Etait varies between 0.2mg/l and 5.4mg/l the highest value recorded on the basin of the copper mill. Etait is not a guide value in the standards: not very toxic. The lead varied between 0.03mg/l and 0.13 where we recorded high values in all the samples because there is a workshop to repair the car radiators with lead in the brassware of Bardo. Cadmium varies between 0.13mg/l and 1.1mg/l where we recorded high values in all samples. Arsenic varies between 0.01mg/l and 0.045mg/l the highest values recorded on the upstream, downstream of Oued Rummel and spring water. Silver the highest values recorded on the upstream, the downstream of Oued Rummel, and the basin of the dinanderie and the water of the sewerage network of Bardo. The Cu, Cr, Ni, Pb, Cd, As and Ag exceed the Algerian standards and the WHO standards (Table 1), on the other hand Zn and Cn do not exceed the standards (Table 1). Atomic absorption spectrometry analyses were performed on the soil samples using the Rodier [8] protocol, to determine the concentration of heavy metals in the five samples. Figure 3 represents the concentration (mg/l) of the elements (Fr, Cu, Cr, Zn, Ni, Cn, Sr, Pb, Cd, As and Ag)

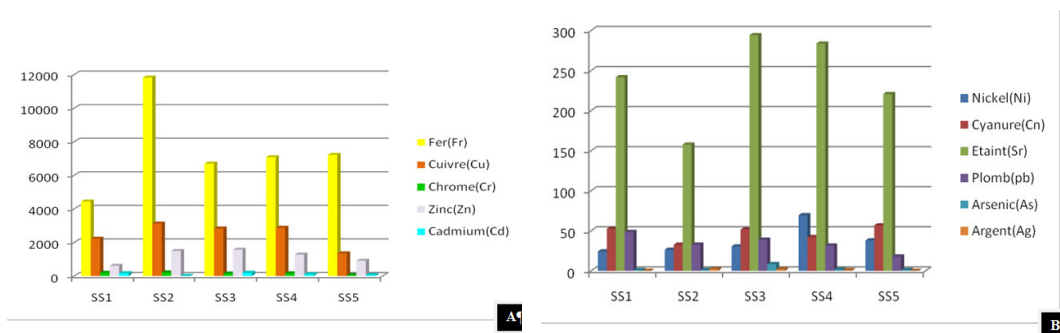


Figure 3. The concentration (mg/l) of heavy metals in the five soil samples. A/concentration of elements (Fr, Cu, Cr, Zn, Cd).B/concentration of elements (Ni, Cn, Sr, Pb, As, Ag)

ES1: soil sample from the entrance of Bardo Garden, ES2: soil sample from downstream of Rummel Oued
 ES3: soil sample next to Salah Bey bridge, ES4: soil sample from upstream of Oued Rummel
 ES5: soil sample next to waste water drains of Bardo

Iron varies between 4440mg/kg and 11825mg/kg the highest value recorded downstream of Oued Rummel. Copper varies between 1355mg/kg and 3125mg/kg where we recorded high values in all the samples 30 times the norm of AFNOR because in the process of cutting copper, the copper particles fall directly to the ground.

Chromium varies between 53.55mg/kg and 210mg/kg where we recorded high values in all samples .Zinc varies between 610mg/kg and 1570mg/kg the highest value recorded at the upstream of Oued Rummel .Nickel varies between 24.15mg/kg and 69. 3mg/kg the highest value recorded in the upstream of Oued Rummel .cadmium varies between 10.5mg/kg and 199.5mg/l where we recorded high values in all samples.(fig3) .Cu, Cr, Zn, Ni, Cd and Pb exceed the norms of AFNOR in all samples.(Table1)

Table 1: Standards of heavy metals in water and soil [6,9]

Heavy metals	Zn	Fr	Cu	Cr	Ni	Cn	Pb	Cd	Ag	Ar
Les normes algériennes (mg/l)	5	0.02	2	0.05	0.07	0.07	0.01	0.03	0.1	0.01
Les normes d'OMS (mg/l)	3	/	2	0.05	/	0.07	0.01	0.03	0.05	0.01
Les normes d'AFNOR (mg/kg)	300		100	30	50	/	100	10	/	/

CONCLUSIONS AND RECOMMENDATIONS

The current situation of the copper smelter Bardo "Constantine" is remarkable, because, metal pollutants found with high concentrations of Cu, Cr, Ni, Pb, Cd, As and Ag in the water that is discharged into Oued Rummel which is used for irrigation in some areas, and discharges into the dam Beni Haroun, it constitutes a threat to the environment and human health [10]. The industrial discharges have a polluting effect on the groundwater and contribute to the degradation of water resources in the region, we recorded high values of Cr, Ni, Cd, Pd in the spring water. We found very high values of Cu, Cr, Zn, Ni, Cd and Pb in the soil. For this reason, the Ministry of Environment and the State must find solutions to reduce pollution, whether by sensitising workers at the coppersmith's shop not to throw directly the liquid or solid discharges into the soil or watercourses and the need to install a filtration station and control the liquid discharges.

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