

## Environment Impact Assessment Of Leather Tanning Industry: Case Study Of A Tannery Transfer In Egypt

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### Synopsis

The Expedited Advent Of Urbanization And Industrialization In Our Countries Has Led To Environmental Degradation And Pollution Of Air, Water And Soil. Tanneries Are Typically Characterized As Pollution Intensive Industrial Complexes.

The Government In Egypt Planned To Relocate The Old Cairo Leather Tanneries Of Magra El Oyoun To A New Industrial Zone In The Outskirts Of The Capital, 54 Km Away From The Actual Site. The Old Area Will Be Used For Touristic Purpose. Magra El Oyoun Wall Is A Medieval Mamluk Aqueduct That Dates Back To About 500 Years And Connects The Nile To The Citadel Of Saladin. The Government's Program Is Judged To Be Ecologically Sound, Economically Viable And Socially Just And Humane.

Tannery Activities Impact Negatively The Environment And The Health Risks Among The Workers Employed In This Industry. The Waste Generated From Leather Tanning Takes The Form Of Solids, Heavy Metals, Liquids, Sludges Or Contained Gases. All These Wastes Pose Potential Threats To Public Health And The Environment.

Conventional Treatment Methods Such As Neutralization, Clari-Flocculation And Biological Processes Are Required To Clean The Effluents Before Dumping Into The Earth. The Conclusions Arrived At From The Preliminary Study Carried Out By Cairo University Insisted To The

Following Remedial Points:

- Soil Replacement Whenever Required
  - Stabilization Of The Soil By Solidification In Some Specific Areas
  - Pumping Of Untreated W Ater Using Tile Drainage Technique
  - Complete Monitoring For The Next 25 Years
  - Protecting Nile River From All Wastes Emanating From Such Industry
- Recycling Of Wastewater Is Required

### Introduction

The Present Study Focuses On An Existing Tannery That Dates Back To About 500 Years, Located In A Crowded Area Of Old Cairo, A City Of More Than 15 Million Inhabitants. The Egyptian Government Decided To Transfer This Old Tannery Of Magra El-Oyoun Wall

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Fig.(1), To A New Industrial Zone In Robbeky  
 Fig.(2), A Neighborhood North-East Of Cairo,  
 To Cope With The Current Booming  
 Worldwide Market For Leather



Figure 1: Behind the historical Cairo wall lies the tanneries

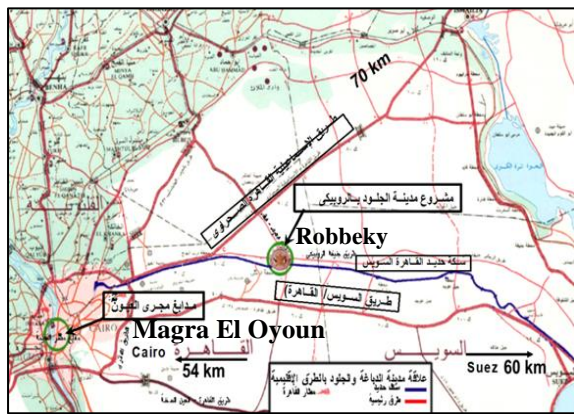


Figure 2: Map showing the location of the new Robbeky City

The New Ideal Modern Area Will Cover A Site Of 350 Acres And Will Be Developed To Incorporate A Decent Residential District, In Addition To Commercial And 41 recreation al Areas Fig.(3&4). This Industrial Leather Tanning Community Will Be Based On The Highest Technological Standards To Attract Investors From The Country and abroad.



Figure 3: Entrance of Robbeky leather city



Figure 4: Modern Robbeky Industrial Building

The Country Is Targeting Two Folds, One To Increase Substantially The Egyptian Leather Exports Providing Thousands Of New Job Opportunities And Then To Ending The Harmful Environmental Effects Due To Decades Of Contamination In The Air, Water And Soil.

A Field Campaign Was Launched To Study The Water And The Underground Soil Conditions Underneath The Tanneries' Site And To Explore The Situation Of The Existing Tannery Surrounding Environment.

The Study Revealed That The Tanning Industry Wastes Pose Serious Environmental Threats On Air, Water And Soil, Even Human Fish And Livestock.

**Tanning Techniques**

There Are A Number Of Different Tanning Methods Available, Depending On What The Final Product's Attributes And Uses Will Be. The Most Popular Of These Methods Are:

- Vegetables–Tanned Leather, Utilizing Natural Vegetable Tannins.
- Chromium-Tanned Leather Which Is The Most Popular Form Producing Leather These

Days That Relies On Toxic Chromium Salts.

- Synthetic-Tanned Leather Using Aromatic Polymers.

In Egypt, Tanneries Adopt The Universal Chromium Tanning Process Because Of Its Processing Speed, Low Cost, Light Color Of Leather And Greater Stability Of The Resulting Product, Ref. [1].

#### **Adverse Effects Of Tanneries:**

Tannery Processing Impacts Negatively The Environment And The Health Risks Among The Workers Employed In The Leather Tanneries. Various Chemicals Are Used During The Soaking, Tanning And Post Tanning Processing Of Animal Skins. The Chemical Used Consists Of Sodium Hydrosulphide And Chromium Sulphate Both Are Known To Be Carcinogenic Agents. Fig.(5) Shows Cheap Labors Working In A Dirt Industry.



**Figure 5: Polluting Tanning Industry**

The Removal And Recovery Of Chromium Content Of Tannery Wastewaters Is Crucial For Environmental Protection And Economic Reasons. The Discharge Of These Solid And Liquid Wastes, Over The Years, Have

Contaminated The Ground And The Subsurface Water With Dangerously High Concentration Of Chromium And Heavy Metals Such As Cadmium And Lead. In Addition To Gaseous Emissions And The Emission Of Foul Odors Polluting The Air Beyond Acceptable Limits. Chromium Is Commonly Found In Huge Quantities In Tannery Wastewaters.

The Accumulation Of These Pollutants And The Dumping Of Untreated Tannery Wastes Are Also A Major Source Of Marine Pollution: Fish And Shell Fish Species, Keeping In Mind That The River Nile Which Is The Main River Of The Country Is Very Near To The Old Tanneries Location. After These Long Decades Of Contamination In The Air, Water And Soil, The Government Decided To Move The Tanneries Site Away Using The Area For Touristic Purpose.

#### **Remediation Of Contaminated Site**

Contaminated Site Poses A Serious Threat To The Environment, Ecosystem And The Human Health Of The People Who Live In It. Dumping Of Solid And Liquid Wastes Containing Leftover Chromium And Other Hazardous Compounds Poses Many Dangers. A Reduction Of Water Use Can Lead To A Considerable Reduce Of The Total Waste Load. Re-Use Of Waste Water May Be Considered As A Viable Option. Also By Removing Non Degradable Matters From The River Is Also A Significant Remedial Action. Most Importantly Proper Laws Should Be Enforced To Reduce The Pollution Of River

Water From This Adjacent Source Of Pollution.



Figure 6: Air drying of Leather

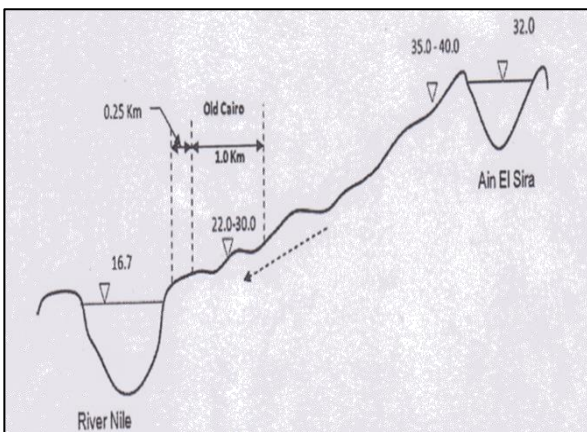


Figure 7: Sketch showing slopes and flow of untreated water

Hundreds Of Soil Samples Were Recovered Using A Variety Of Methods And Equipment Depending On The Depth, The Soil Type And The Required Sample Whether Disturbed Or Non-Disturbed.

### Study Plan

The Centre For Environmental Hazard Mitigation, Of Cairo University Undertook A Preliminary Study Ref.[2], Consisting Of Thirty Boreholes From 2.5 To 8 M Depth Were Performed For Subsurface Reconnaissance Purpose. A Numerical 3-D Mathematical Model Was Developed To Simulate The Underground Water Movement.

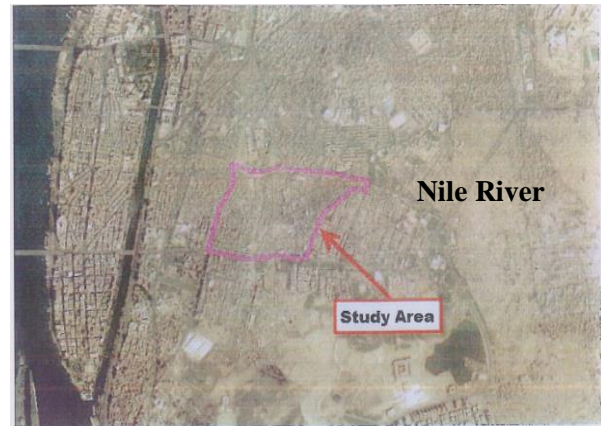


Figure 8: Studied Area Of Magra El Oyoum Location

The Numerical Data Obtained From This Model Was Compared To The Real Data Collected From The Site. The Toxicity And The Degree Of Contamination Of The Soil And The Water Were Confronted With The International Standards And Norms, Ref. [3]. The Topographic Survey Showed That The Difference In The Underground Water Level Between The Tannery's Location And The River Nile Is About 16 Meters As Shown In Fig.(7). This Means That The Untreated Water Flows From Up To Be Dumped Straight To The Nile Contaminating Its Water. The Flow Of The Underground Water Is Also Facilitated As The Soil Formation Underneath The Tanneries Is Constituted Of Porous Materials With High Flow Characteristics: Sand, Fine Particles And Gravel, As Showed By The Soil Extracted Samples.

### Successful Transfer Of Robbeky

All The Case Studies Showed That Relocation Of Tanneries Is Indeed Very Complex Ref.[4], Yet Some Lessons Can Be Learned. The Following Factors Need To Be Strictly Observed To Accomplish The Desired



Aim Of The Transfer:

- Modernization Of The Tanning Industry: Equipment, Methods And Machinery Is Essential;
- Strict Segregation Of Streams Of Chrome Free And Chrome Contained Liquor Is Required;
- A Modular Central Effluent Treatment Plant Is Needed;
- Solid Waste Management Should Focus On By-Products To Reduce Disposed Volumes Of Landfill

### **Conclusion**

The Study Arrived At A Remedy Plan, For The Existing Toxic And Heavily Polluted Site Of Magra El Oyoun. One Immediate And The Other Extended Over A Long Term, Both Are

Based On A Monitoring Campaign And Assessment Of Readings For The Next 25 Years. Some Of These Remedies Consisted To Replace The Soil In Some Parts Of The Existing Tannery. The Study Recommended Also To Stabilize By Solidification The Soil Underneath And Suggested To Pump Untreated Water By Means Of Drilling A Series Of Drainage Wells Combined With An Efficient Tile-Drainage System. All These Measures And Precautions Are Expected To Contribute Bringing Down And Decreasing The Observed High Underground Water Level.

The Study From A Technical Point Of View Was Accepted But Is Lacking The Financial Part And The Cost Estimate For The Suggested Remedies.

### **References**

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- 3- "Guideline For Contaminated Site Remediation, Canadian Council Of Ministers Of The Environment (CCME), Winnipeg, Manitoba, Canada.
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