

## EMPIRICAL RESEARCH ON WASTE MANAGEMENT OF ART CONSERVATION WORKSHOPS IN GREECE

PATATOUKOS S., TZABERIS N., XENITIDOU S. and PAPAVALSILEIOU V.

University of the Aegean, Dimokratias 1, Rhodes 85100 Greece  
E-mail: tzaberis@rhodes.aegean.gr

### ABSTRACT

The complexity of the problems humanity is facing indicate the difficult situation of the planet, which even threatens the survival of all life forms (IPCC, 2014). The measures taken not only they fail to address the problems effectively as expected, but they contribute to the perpetuation of this situation with uncontrolled consequences (Koroneos & Rokos, 2012). In this climate of uncertainty people are invited to adapt appropriately in order to confront the new problems with boldness (Kaila *et al.*, 2013).

In the direction of the search for solutions, the international community focuses on scientific research data to support and promote a more effective education (Stevenson, 2007); an education able to bring profound changes in human society based on the connection of the individual with the natural world (Dahl, 2012). In this context education for the environment and sustainability is the surest way to establish environmental friendly behavior as part of everyday practice (Kalaitzidis, 2007), as it contributes to the acquisition of skills for the investigation, analysis and addressing of environmental issues from a holistic perspective (Lekkas & Kolokythas, 2009).

In this framework, the aim of the present paper is to explore the environmental knowledge, the attitudes and the behavior of art conservators who during their work procedures make use of various chemicals and other substances hazardous for both humans and the environment. For this reason it is necessary for art conservators to develop pro-environmental awareness and behavior through special training, and obtain in their workshops the appropriate infrastructure, so that waste management can be rationalized both in the production phase and as a whole.

The survey was conducted during the period September-June 2014. It was a cross-sectional, field and qualitative research with random character having the questionnaire as main research tool.

From the analysis of the research data it is shown that the buildings where most conservators work, are either old or listed, generally in a poor condition. A large proportion of the survey sample chooses to collect for recycling used batteries, plastic and glass bottles and newspapers and magazines. Most conservators choose to throw hazardous liquids simply in the sink without thinking where these will end. A small percentage of the research sample chooses to reuse the lancets blades and paper waste.

It may be concluded that the art conservators do not have the required knowledge nor the means to manage the hazardous waste they produce during their work procedures. However, they are willing to cooperate with special state agencies, get training and the necessary information for themselves and their collaborators. They consider guidance from special agencies is needed, as well as support from specific organizations, and the development of a written waste management manual available to them for consultation.

**Keywords:** Wastewater, art conservation workshops, sustainability.

### 1. Introduction

Man through his experience over thousands of years acknowledged the importance of water for his existence and development, trying to control its uncertain availability in order to steadily face his

needs. This process is disturbed in recent decades surpassing the critical limits of the planet's natural balance (Huckle, 2012) due to worsening environmental problems, the consequences of which threaten the survival of all life (IPCC, 2014). These problems affect all components of the environment and the water (UNEP, 2011), which is the regulatory number one factor for economic, social and cultural development of any country, and may be the element of acute confrontation and possibly the cause of a future war due to pollution or depletion (Mimikou, 2009). The greatest problem in the disturbance to the balance of water bodies comes from polluting contaminants and of liquid waste with a significant degree of risk. Although this pollution is not immediately perceived due to the lack of visibility and detection ability (Chen *et al.*, 2002), it is further worsened when wastes from specific processing activities contain heavy metals and have a toxic effect (Hilal *et al.*, 2011). In art and antiquities preservation laboratories the use of chemical solutions and hazardous substances is necessary, but in many cases these substances end up in the recipients after washing the laboratories' tools. In addition, the packaging and the relevant expendable materials are discarded as mere wastes. Therefore, this activity can have serious consequences in both humans and the environment if appropriate measures are not taken.

Solving the problem requires knowledge, awareness and shaping such attitudes which are governed by a moral code of respect and values (Tzaberis *et al.*, 2014). Values which help establish sustainability for the prosperity of present and future generations through the triptych interdependence, interconnectedness and interaction (Papavasileiou, 2015). To this end the role of Environmental Education (Papavasileiou, 2011) was recognized as essential, seeing that the educational processes for sustainable development aimed at the creation of comprehensive personalities with knowledge and optimism, and as to how to face with a positive attitude all sorts of environmental issues (UNECE, 2005). Such training undoubtedly emerges as an indispensable factor that can contribute to the reorientation of values and the required adjustments in policies and practices at all levels (Tzaberis & Papavasileiou, 2010).

## **2. Methodology**

Purpose of the present paper is to investigate general awareness, knowledge and attitudes of professional art and antiquities conservators, concerning environmental and sustainability issues, and in particular the waste management of maintenance works in art workshops. The survey was conducted during the period of September to June 2014. It is a random, cross-sectional field and qualitative survey which uses the questionnaire as a data collection tool. The questionnaire was built on five research axes and comprises of 40 questions; of which thirty 35 are closed type and 5 are open type.

In the conducted survey using systematic sampling 146 conservators took part from twenty two prefectures of Greece. Emphasis was given to the prefectures of Attica and Thessaloniki. Of the surveyed conservators 55 (38%) specialized in mural restoration, 51 (35%) in the restoration of portable icons, 49 (34%) specialized in wood restoration, 44 (30%) in restoring ceramics, 33 of the conservators (23%) worked in the restoration of canvas paintings, 31 (21%) in mosaic restorations, 29 (20%) in the restoration of books and paper, 28 (19%) in stone restoration, 25 (17%) in the preservation of organic materials, 22 (15%) in restoration of glass, 14 (10%) in fabric restoration and 5 conservators (3%) in restoring photographs.

## **3. Results**

Initially the interviewed conservators are asked if they belong to an environmental organization or group. Out of the 146 conservators, 11 (8%) answered that they do belong to an environmental organization or group, while the rest 135, a large 92 percent, responded negatively. When asked whether they have participated this year in a reforestation, the responses were the same, i.e. 135 of the conservators (92%) have not participated and 11 (8%) have participated.

Investigating the kind and age of the buildings where the restoration workshops are located, 56 conservators (38%) answered that they work in old buildings, 49 (34%) in listed buildings, 39 (27%) in newer buildings; one (1%) is working in a prefabricated building and one conservator (1%) works at a Byzantine museum. When questioned on the installations (plumbing, electrical, etc.) of the laboratories, 84 conservators (58%) responded that they have old installations in their

laboratories and 62 (42%) said that their labs have modern installations.

When asked what they do with paper waste in their workshops, 78 (54%) said that they recycle, 62 (21%) that they throw it in the garbage and 6 (4%) that they reuse it. Regarding the used lancet blades, 113 (77%) said that they throw them in the garbage and 33 (23%) that they recycle the blades. There were similar responses as to how they manage empty glass and plastic bottles, aluminum packaging and used fluorescent lamps; when asked what they do with the used impregnated with a solvent cottons balls, 60 of the conservators (41%) said that they throw them in a container filled with water and later in the trash, some 50 (34%) said that they throw them directly in the garbage, 23 (16%) said that they leave the used cotton balls to evaporate outdoors and then handle them as solid waste, 12 (8%) responded that the used cotton balls are left to evaporate under the exhaust system and then are handled as solid waste and one of the conservators (1%) said that he dispenses the used impregnated cotton balls to the waste management company.

The next question relates to the liquid hazardous waste in their workplace, and 63 of the conservators (43%) answered that they pour them in the sink, 32 (22%) said that the liquid wastes are left to evaporate, 32 (22%) answered that they collect them in containers and are picked up by a certified waste management company, 24 (16%) said that liquid wastes are left to evaporate under a hood, 7 (8%) that they throw them in the trash, 5 (3%) said that they use a processing unit / chemical waste neutralization, 5 (3%) that they do not use hazardous liquids, 3 (2%) that they place them outside and let them evaporate outdoors, 2 (1%) answered that they use an airtight container and then throw them in the garbage, 2 (1%) that they pour them in a barrel filled with sand, one of the conservators (1%) that he stores them in special packaging till their evaporation, one (1%) said that in general he does not use hazardous liquids and one (1%) collects them in containers. Next question to the conservators was, if they consider washing chemicals down the drain to be dangerous. 137 (94%) answered positively that they do consider it dangerous and 9 (6%) did not. When asked which are the reasons they think that pouring chemicals down the drain is dangerous, 66 restorers (45%) said that there is danger because the water resources are contaminated, 64 (44%) answered that it is because they pollute the environment, 14 (10%) said because they destroy the sewerage system and 2 (1%) consider pouring hazardous liquids down the drain to be dangerous for hygienic reasons. When asked whether they could add some acids or bases to be neutralized in the laboratory, 81 (55%) responded positively, 63 (43%) responded negatively and 2 (1%) responded that they do not know.

The next question given to the conservators concerned their equipment in their laboratories. 96 (66%) responded that they have natural ventilation, 70 (48%) that they have a central exhaust system, 63 (43%) have an exhaust chamber, 58 conservators (40%) have portable gas extractor, 26 (18%) have fans and 6 conservators (4%) answered that they do have an acid-alkali neutralization system. When asked whether they share the view to adopt greener practices, 87 (60%) answered "very much", 39 (27%) "very", and 20 (14%) "enough". Next when asked if they thought that their colleagues shared their view for greener practices, 63 (43%) answered "somewhat", 47 (32%) "very", 18 (12%) "very much", 17 (12%) "a little" and 1 conservator (1%) answered "not at all". For the biggest obstacles to reducing energy consumption in their work, 90 (62%) believe that the biggest barrier is installations, 86 (59%) that is lack of information, 71 of the restorers (49%) that is due to the administrative management authority, 14 (10%) said that the major obstacles are other conservators in the lab, 9 (6%) that the economic factor is an obstacle and one conservator (1%) said that the obstacle is indifference.

When asked to mention up to 5 of the most dangerous / toxic / carcinogenic materials they use in their labs, numerous responses were given: 73 (50%) reported the acetone, 36 (25%) the toluene, 34 (23%) reported the white spirit, 29 (20%) said the hydrochloric acid, 25 (17%) said ammonia, and the rest 25 (17%) said "and many others." To the question if they have attended a seminar or had some information concerning hazards and waste management, 124 (85%) responded negatively and 22 (15%) replied positively. As for whether there is a written waste management manual in their labs, 138 of the conservators (95%) responded negatively and 8 (5%) responded positively.

#### 4. Conclusions

The survey results indicate that conservators, who are members of environmental organizations, are scarce, as are those who have participated in a reforestation. The buildings where most conservators work are listed or old as are their installations.

The responses to the question on handling paper waste, are not positive, even if most of the conservators recycle it, still an important percentage throws the paper waste in the trash. Also most of the conservators do not choose to recycle the lancets' blades and they end up in the dumpster. Furthermore, for the used soaked in solvent cotton balls, there is no proper management; very few conservators follow a correct practice, which is to treat them as hazardous waste and to deliver them to a waste management company. Also with regard to the practices adopted by most conservators for hazardous liquid waste, they are not as environmentally friendly as most choose to pour them down the drain although they know how dangerous it is.

In addition, most conservators state that some acids or bases can be neutralized in the labs, which is the proper procedure. Asked about the equipment and the means they have in their labs, the results were not encouraging. Furthermore, a large percentage of the surveyed conservators state that they are positive in adopting greener practices and very few are negative. A large group of conservators states that their labor association holds a neutral position towards adopting more sustainable practices and only a smaller group claims that their employer holds a positive position.

Continuing, the biggest obstacles to conservators in reducing the energy footprint of their work, are the installations, the lack of information, followed by the administrative authority. Many conservators state that they have not attended any seminars or had some updated awareness information about hazard and waste management. Finally, as it is clear from their responses, the majority states that there is no written waste management manual in their labs.

It is therefore necessary special seminars to take place continuously in all districts of our country offering access to all conservators and even be compulsory to follow. Moreover, it is necessary a waste management manual to be provided in every laboratory. Finally, it is important that all those involved in art conservation to attend specialized courses related to the environment and environmental issues in order to acquire relevant knowledge, values, attitudes and skills in order to better protect the environment.

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