

# LANDSCAPE ARCHITECTURE CASE STUDY FOR IMPROVING ABANDONED NAVAL TRANSPORTING EQUIPMENT INTO FLOATING GARDENS

## STUDIU DE AMENAJARE PEISAGERĂ ÎN VEDEREA REABILITĂRII UNOR UTILAJE NAVALE ABANDONATE SUB FORMA UNOR GRĂDINI PLUTITOARE-MOBILE

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**Abstract.** According to an inventory conducted by the Ministry of Environmental and National Water Administration, a number of 632 barges were found with several deficiencies of which 21 are inoperable barges, 63 barges were abandoned, 5 barges are proposed to be listed in the abandoned procedure and the remaining of 543 have major damages. The present paper aims the recycle or conversion of such abandoned marine equipment through the Ecodesign concept. Thus, barges can be put back into operation with a new purpose, such as floating gardens with functional and decorative form. In terms of actual planning, the platforms would be transformed into decorative gardens with pavilions and „green roofs”. Such investment is beneficial both for the environment by turning waste into green spaces that help the reduction of pollution but it would help improving the Romania tourism by offering a new concept towards public opinion.

**Key words:** floating gardens, barges, ecodesign, green roofs.

**Rezumat.** Conform Ministerul Mediului și Gospodăririi Apelor și Administrației Naționale „Apele Române”, la un număr de 632 de barje s-au constatat o serie de deficiențe din care 21 barje sunt nefuncționale, 63 barje sunt abandonate, 5 barje sunt propuse pentru a fi trecute în procedură de abandonare iar restul de 543 prezintă defecțiuni majore. Lucrarea propune reciclarea unor astfel de echipamente navale abandonate cu ajutorul conceptului Ecodesign sub forma unor grădini plutitoare. Spațiile unde pot fi instalate aceste platforme sunt ape stătătoare de dimensiuni medii sau mari, înconjurată de spații terestre. Plantarea în sine ar folosi tehnicile „acoperișurilor verzi”, irigarea putând fi proprie printr-un sistem de filtrare a apei înconjurătoare iar curentul electric putând fi prezent prin energie solară. O astfel de investiție este benefică atât pentru mediu, deșeurile fiind transformate în spații verzi ce ajută la reducerea poluării cât și pentru turismul României, proiectul oferind un concept nou publicului.

**Cuvinte cheie:** grădini plutitoare, barje, ecodesign, acoperișuri verzi.

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## INTRODUCTION

A barge is considered a ship with plain bottom with or without propulsion, used for transporting heavy materials on river runs or secondary usage for different marine interventions. Barges are moved with the help of a pusher ship, emplaced at the back of the convoy (<http://www.navrom.ro>). Due to its constructive flat bottom, on the Danube river the barges traffic its permanent all year around, constrained by the minimum water depth level of 2.8 meters. The standard dimensions of a Danube river barge are: 89 m length, 15.3 m width 3.3 m draft and a weight capacity transport of 3000 t.

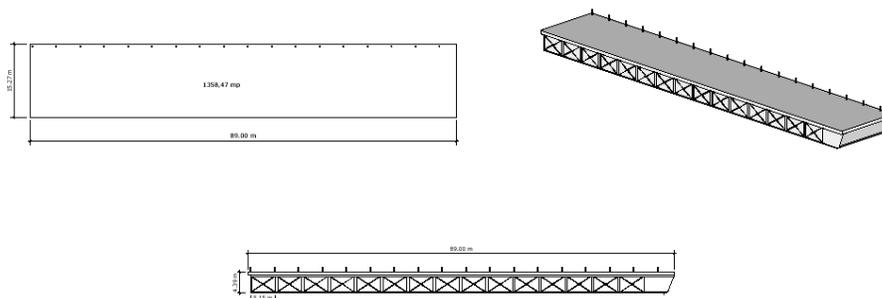


Fig. 1 - Technical aspects of the studied barge (original)

The beneficiary profile is related to people that are keen on environmental protection and its durable development, dynamic persons, that tend to spend their relaxing activities in open air. Also the beneficiary profile consist in people keen on different open air cultural activities, that will try the new offered perspectives of a - „recycled island”. Freely landscaped designed, the floating garden is keen on functional purpose for cultural exhibition and workshop establishment. The final implementation of the propose floating gardens could be made on static water or floating water, the barges being attached by a pusher ship offering an dynamic landscape generating new perspectives.

The active surface of a barge was established at 1358,47 m<sup>2</sup> offering an maximum amount of visitors established at the value of 100 people/barge, resulting a surface green area of 13,58 m<sup>2</sup>/visitor. The general principles taken into study for designing the floating gardens where keen on „Eco Design” and „Land Art” concepts (Chet Van Duzer, 2006).

## MATERIAL AND METHOD

The present paper wishes to resolve the problem of abandoned naval construction by transforming them into long-lasting recycled floating gardens. The case study reflected the standard dimensions of a average barge that transits the Danube river with the following dimensions: 89 m length, width 15.3 m, depth 3.3 m and a transport capacity of 3000 to. The general principles taken into study for designing the floating gardens where keen on „Eco Design” and „Land Art” concepts, generating a floating garden for different human activities as art exhibition and workshops.

## RESULTS AND DISCUSSION

The floating garden designed for cultural activities and workshops, is delimited by an ornamental concrete fence with beech wood insertion, treated with mat varnish. The height of the surrounding reaches 80 cm with an width of 30 cm, where we propose mono-block flower pots. In alternance with the propose delimitation we propose secured ornamental glass with wood frames. For plant usage in the mono-block flower pots (fig. 2) we adopted the general term of perma-culture using perennial species as: *Cana indica*, *Hedera helix*, *Hosta plantaginea*.

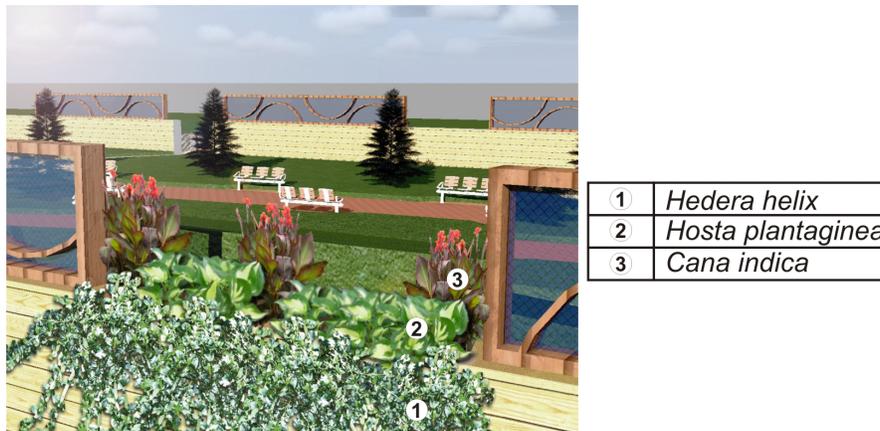


Fig. 2 - Planting detail (original)

The barge involves the creation of a covered stage, coated by secured glass and impermeable textile material by its sides. The surface of the stage is 136 m<sup>2</sup> offering sufficient space for different cultural activities.

During the CAD construction of the design where obtained the following area calculations (table 1).

Table 1

### Surface calculation by usage category (m<sup>2</sup>)

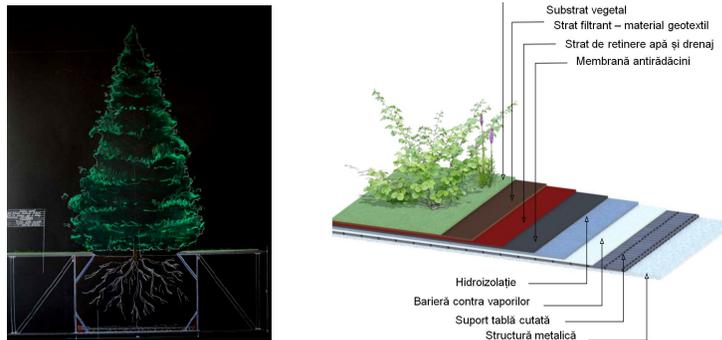
No.	usage category	area (m <sup>2</sup> )	% from total
1.	total area	1358	100
2.	pathways	150	11,04
3.	small plaza	290	21,35
4.	green area	760	55,96
5.	event stage	136	10,01

The proposed landscape design implemented location for 30 benches constructed by usage of durable aluminum and oak wood insertions treated with varnish. The proposed benches are designed for a common usage of 3 persons/bench, offering a total sitting capacity of 90 persons (fig. 3).



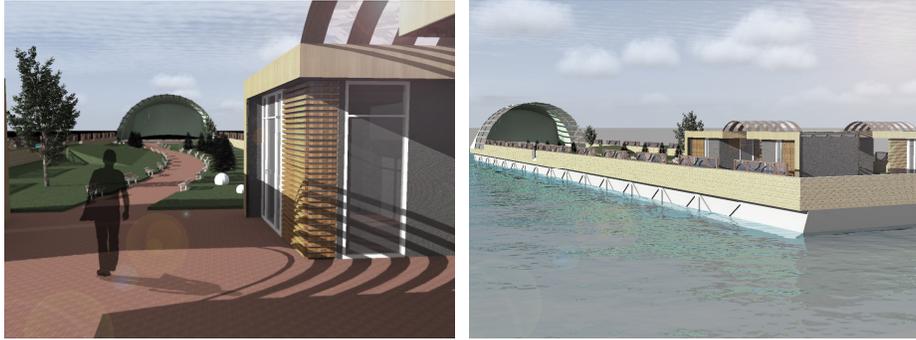
**Fig. 3 - Surrounding perspective (original)**

The two topographic positive modification upon the soil offered sufficient space for art exhibition, vertically arranging the art exponents available for everyone's point of perspective (<http://www.mogat-werke.de>). Area calculation for the sloped terrain consisted in 92.3 m<sup>2</sup> (left side) and 137.3 m<sup>2</sup> (right side) with maximum heights of 0.5 and 0.8 m generating a uniform slope for visitors acces (<http://www.mogat-werke.de>). The landscape design consisted in usage of different tree gender composed by 13 species of *Picea pungens* var. baby blue and 2 species of *Betula pendula*. As planting techniques we take into consideration the height of the barge and its transport capacity, obtaining an optimum soil volume drained with a layer composed by sand + gravel. Regarding the turf seeding we adopted a standard geotextile system (fig. 4) used for green roof design (<http://www.greenroofs.org>; <http://www.liveroof.com>).



**Fig. 4 - Hydro isolating materials and geo-textiles used for planting technology (original)**

The proposed building at the N side of the barge (fig. 5), was conceived as a one level building, functionally regarded as art exhibition center when meteorological conditions are improper or sightseeing info point.



**Fig. 5 - Proposed art center perspectives (original)**

In the vicinity of the exhibition center we proposed spherical lightning spots (fig. 6) lightened with sodium light bulbs, assuring an optimum relation with the minimalist design adopted.



**Fig. 6 - Spherical lightning posts (original)**

## CONCLUSIONS

During the project implementation, special consideration will regard the maintenance of the proposed landscape design divided in two stages:

- maintenance operations after planting, witch can last minimum 2 years, where are considered slopes consolidation. During this period of time special consideration will regard the fertirigation system, obtaining a moist and fertile substratum. For a better conservation of water an nutrients we propose organic mulching system (<http://www.optigreen.co.uk/index.html>;<http://www.optigruen.de/index.html>);

- during the service period of the floating garden, special consideration will be keen on weed suppressing (<http://www.mulehide.com>).

The constructive barge type was a maximum weight transport capacity of 3000 to., sufficient for generating a fertile planting substratum, assuring optimum root development for plants, shrubs and trees.

The standard height of a barge differs from 2.60 m till 4.40 m assuring optimum root development. The proper root development was obtained by a rigorous structure compartment, constructed with vertical steel walls protected by an impermeable layer. The vertical walls are consolidated with metallic braces for maintaining the substratum structure.

The lifespan of the floating gardens is considered the period of time where the properties of the barge are kept in optimum condition related to its design purpose. The lifespan period is established under a rational usage, considering all the maintenance cost during the entire lifespan (Life Cycle Cost):

- renovation costs for the damaged barges;
- projection, execution and exploitation costs;
- costs resulting from exclusive situations, such as improper meteorological events;
- costs regarding partial restoration;
- inspection, maintenance and repairing elements costs;
- recycling and decommissioning costs;
- environment protection costs.

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