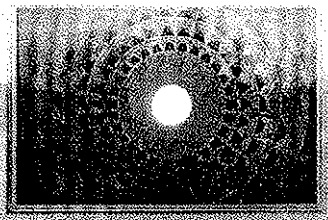

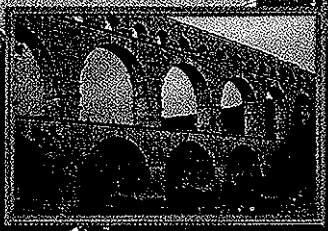

Structural Studies, Repairs and Maintenance of Heritage Architecture IX

WIT PRESS

Editors: C. A. Brebbia and A. Torpiano

Structural Studies, Repairs and Maintenance of Heritage Architecture IX

Volume 83 of the WIT Transactions on The Built Environment

This book contains most of the papers presented at the Ninth International Conference on Structural Studies, Repairs and Maintenance of Heritage Architecture. The Conference was held in Malta, a state smaller than many of the cities that this Conference has visited, and yet that is packed, in the full meaning of the word, with a history of heritage architecture that spans nearly six millennia – as far as we currently know!

The islands of Malta have limited material resources, in fact, only one – limestone, and a rather soft one at that. However, out of this resource, our ancestor builders have fashioned the habitat for their lives, as these unfolded and changed over the centuries. The problems and efforts that are being made to repair, restore, conserve and protect such limestone architectural heritage are considerable and mirror similar problems faced by other architects, engineers, curators, art historians, surveyors and archaeologists in other countries throughout the world.

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Contents

Tide Mills – In route of one forgotten heritage

M. Santos
Barreiro College of Technology, Setúbal Polytechnic, Portugal

Abstract

Tide mills situated along the estuary of the River Tagus are considered to be an important part of Portuguese heritage dating back to pre-industrialisation. These large solid structures made of stone have great architectural value and in former times were the basis of a small flour-milling industry which was particularly important in the making of 'biscoitos', a type of sea-biscuit used on ship voyages during the Portuguese Discovery period in the XV century.
A significant number of these tide mills can be found in the River Tagus basin, close to the capital, Lisbon, however the largest number of Tide Mills is recorded in the Algarve region with a total of 47 units.
This paper will establish the economic role tide mills played in Portuguese pre-industrial history. It will also outline cultural aspects of tide mills, referring to their historical content, draw attention to their present state of abandonment, and in some cases ruin, and will highlight the urgent need for their classification, conservation and renovation.

Keywords: tide mills, Tagus Estuary, industry, engine mills, safeguard, heritage.

1 Introduction

This paper aims to draw attention to the forgotten heritage of tide mills, in this case, Portuguese tide mills situated on the River Tagus. These large impressive constructions played an important role in the milling industry, during their time, by supplying flour to the capital (Lisbon). A large quantity of this flour was used to make an important foodstuff, the "biscoito" (a type of sea-biscuit which was especially made for maritime use during the discovery period, in Portuguese history through out the XV century).

These large constructions with foundations made of stone, had a commanding presence on the banks of the River Tagus and functioned almost as a small industry, in its own right, revolving around the production of flour, utilizing various millstones operating at the same time.
The size of the tide mills depended on the number of millstones they possessed and they tended to be larger than their counterparts elsewhere (they utilized a horizontal wheel "rodízio", which was different to the majority of Europe, which utilized a vertical wheel making the tide mills smaller in size). The larger mills had an adjoining house for the miller to work and live in. The mills were also important to the community as they served as small ports and for the transporting of goods. A nursery for fish and seafood was created in the area where water was retained.
It seems a shame that the majority of these constructions have despaired/disappeared and the ones, which exist, are mainly in ruins.

2 Portuguese tide mills

2.1 National overview

After the XIII century, Portugal started to convert its traditional river mills into tide mills.
The oldest tide mills found in the Iberian Peninsula [1, 3] are situated in Castro Marim (in the Algarve). On a national level, the Algarve has the most tide mills registered, 47 units in total [1], fig. 1.

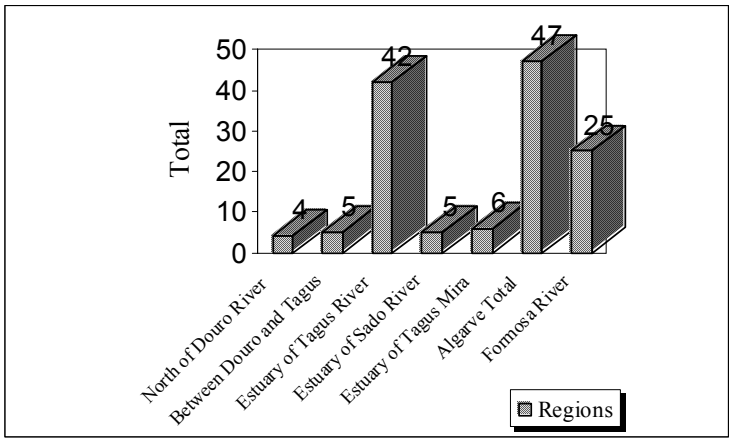

Figure 1: National Inventory

The reason for the large concentration of tide mills on the Algarve Coast, is due to geographical conditions, commercial activity in its busy ports and the presence of armies which defended the territory during this time.

2.2 Estuary of the River Tagus

On the banks of the River Tagus the second largest concentration of River mills can be found, with 42 units in total [1,2,3] (fig. 2 & 3).

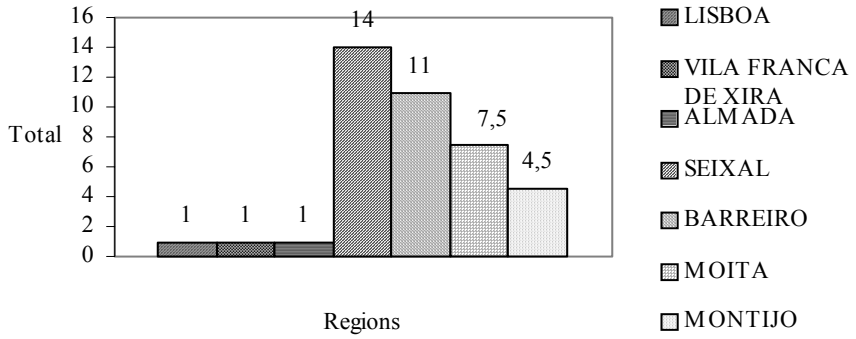

Figure 2: Inventory of the Tagus River Estuary

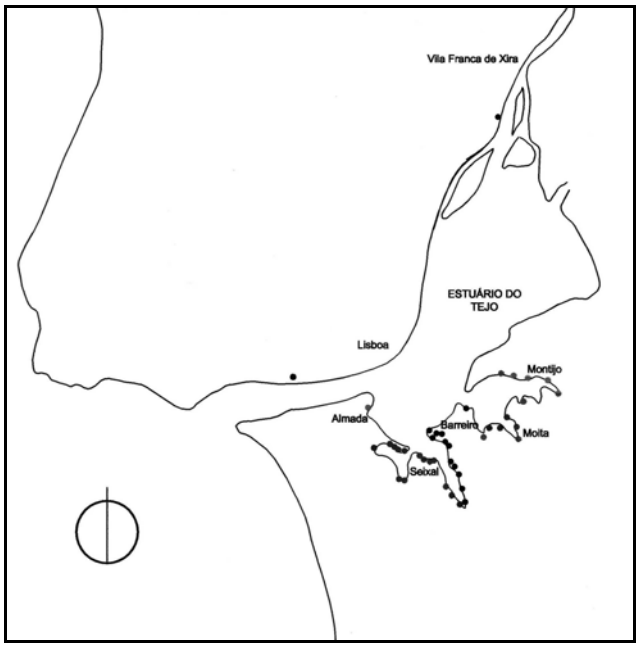

Figure 3: Distribution of mills along the estuary

The first mills were constructed along the estuary of the River Tagus, Lisbon and Montijo. Unfortunately, Mills which were constructed in Lisbon in 1313 disappeared after the earthquake of 1755 [3,4], mill in Montijo (Lançada) were built between 1386 and 1405, [3].
During the XV to the XVI Century, around 20 tide mills were constructed (which corresponds to a total of 60 millstones, taking into account the fact that each tide mill had 3 millstones). It was after this date, that the remaining mills were constructed on the estuary [3].
In 1403, D. Nuno Alvares ordered the construction of one of these mills in Corroios, which was the first in the borough. [3] (fig. 4).

Figure 4: Corroios mill (Seixal)

2.3 Decline of tide mills in the River Tagus Estuary

The XIX century marked the beginning of the Industrial Revolution in Portugal and with it came the use of steam machinery. With the development of hydraulic energy, some mills were adapted to new forms of energy and modernized.
For this reason, many mills were adapted into the 'rodete' [6] style instead of the old 'rodizio' system as it reduced the milling time. This is evident in some mills throughout the Algarve region, which adopted the new wheel. [1]. Towards the end of the XIX century and the beginning of the XX century, some boroughs modified their mill function, from milling cereal into peeling rice, [1,3,7].

Other mills were modified for use in other industries and came to be used in fertilizer factories and for fish flour production. (Moinhos do Brayner and Moinho Velho dos Paulistas, situated in the borough of Seixal (fig. 5 & 6) Others

were being used as electrical centers (turbines at Moinho do Vale de Zebro, in the borough of Barreiro), while some were used to de-husk rice (common in several boroughs), [1,3,7].

Figure 5: Seixal mill, Moinhos do Brayner (transformed in the XIX century into a fertilizer factory)

Figure 6: Seixal mill – Moinho Novo dos Paulistas, (subject to successive alterations)

With the birth of steam machinery in the XIX century, the traditional milling process practically disappeared.

Throughout the XIX century, the larger mills still served a purpose - the mill in Corroios hosted concerts in its granary and fishing in its dam. Whilst the big mill in Barreiro served for swimming championships and water-polo [3,7].

A few tide mills still functioned along the River Tagus estuary during the first half of the XX century, after which the milling industry started to be abandoned, and the mills feel into disuse. Today only a few mills remain: of the 42 that existed only 27 remain of which 5 are in a reasonable state, (fig. 7 & 8). Those tide mills which still remain in the River Tagus estuary, with few exceptions, are in a state of abandonment and total ruin.

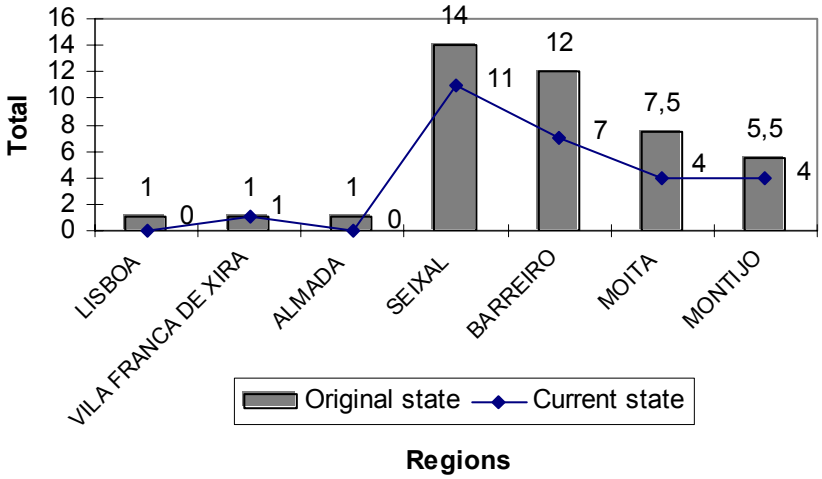

Figure 7: Original state / current state.

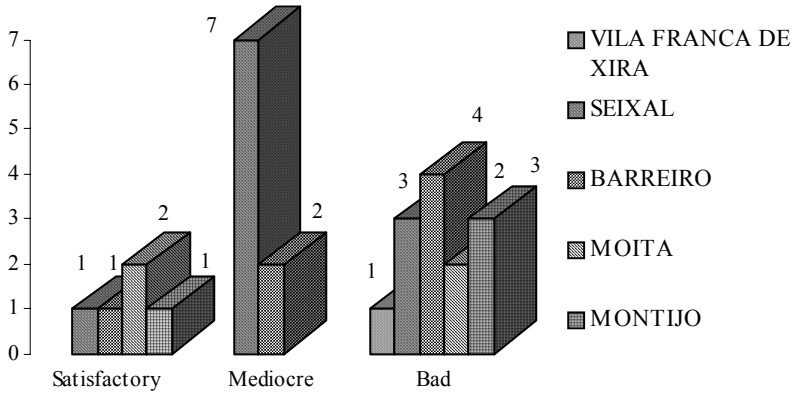

Figure 8: State of conservation.

One mill, which is found in Corroios, is in a particularly good state of conservation, having been acquired and restored by the borough of Seixal in 1980. In 1986 the mill was transformed into an eco-museum by the local industrial heritage society, and it is to date, the only mill in the region which has

been reconstructed and restored to its original state using traditional equipment (fig.4).
This borough does possess another mill (Novo dos Paulistas) for which it does not have a defined project as yet (fig.6).
In 1984 the mills in Seixal were classified as public listed building by the national directive 29/84. The mill in Alhos Vedros (Moinho do Cais) (fig.9), belongs to the borough of Moita and its exterior has already been restored, and there are plans to restore the mill internally by converting it into an eco museum like the mill at Corroios.

Figure 9: Moita mill (Moinho do Cais).

The borough of Barreiro (fig.10) purchased a mill, but without its milling mechanism, with the objective of restoring it to create a cultural activity space.

Figure 10: Barreiro mill (Moinho Pequeno).

The borough of Montijo has also purchased a mill with the intention of transforming it into an eco museum. (fig. 11&12).

Figure 11: Montijo mill, Moinho do Cais (in ruins) – 2000

Figure 12: Montijo mill, Moinho do Cais (in restorion) – 2005

3 Conclusions

When the tide mills on the River Tagus were constructed, they were of great economic importance and their large solid structures represented an important pre-industrial presence.

The construction of tide mills on the Portuguese coast differed from that in other European countries, as already stated, in that Portuguese mills utilised a simpler mechanism.

Portuguese tide mills were largely ignored for many years, unlike windmills and water-mills, which resulted in progressive abandonment or alteration. Indeed, those that remain in the estuary of the River Tagus are very few, and of these the majority are in an advanced state of deterioration.

Once the importance of these mills was belatedly recognized an industrial heritage bill was passed to protect them.

We find that the mills on the River Tagus have broadly similar technical characteristics and overall form and layout and that their function was very much associated with the production of flour for the capital and maritime 'biscoitos'.

The Borough of Seixal has very successfully restored one example into a living museum, where it is possible to relive bygone times. This was a major undertaking involving the gathering of information from people who were associated with Tide Mills, facts and authenticity being very important in restoration, and the setting up of a technical team, specialising in the restoration of national heritage. The Borough of Seixal is therefore to be commended on their considerable achievement.

It is recommended that we should further study ways of recuperating these units, although not necessarily with the intention of putting their mechanisms functioning as so many no longer exist, and establish procedures for cleaning out the weirs and where possible restoring the architecture.

This project could be carried out in several ways: by offering incentives to their owners and encouraging them to find funds and donations from relevant bodies. They could be turned into income-generating cultural centres, perhaps as part of a heritage trail, and serve as tourist attractions, seeing as tourism plays such a large part in our national economy. The heritage trail could include trips on traditional boats, in line with cultural programmes already in existence in the Borough of Seixal. Local geography would allow all units, in various boroughs to be visited in one outing.

There already exists a level of commitment in various boroughs to restore their Tide Mills and, if this, in fact is carried out, then these units could be saved from the ruin or demolition which has already been the fate of many of their kind.

The most important aim would be to give life to what remains of these units, and even though it may not be possible to restore them completely, at least they could be protected from further deterioration.

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[1] Custódio, Jorge, communication: Moinhos de Maré em Portugal, Coimbra 1986, *I Encontro Nacional sobre o Património Industrial,* pp 343-387.

[2] Information extracted from a number of documents, cross referencing information form several boroughs. Of particular interest is the case of a mill belonging to two neighbouring boroughs, Moita and Montijo: the mill possessed four mechanisms of which two were registered in each borough, thereafter the Mill being known as 'The Half Mill".

[3] Nabais, António J. C. Maia – *História do Concelho do Seixal – Património Industrial –Moinhos de Maré,* Câmara Municipal do Seixal, 1986.

[4] XVII century map of Lisbon

[5] XVII century print of Alcântra, In: *A ponte de Alcântara e suas circunvizinhanças*, Olissipo magazine, n.º 18, Lisboa, C.M.L. 1942, pp.53-55, 57, 67-69, 75.

[6] Rodete – sort of turbine

[7] *Um Olhar sobre o Barreiro* - Special issue – História dos Moinhos do Barreiro, pp. 5-36, nº2, III Série de Novembro de 1993,