DOI: 10.23968/2500-0055-2024-9-4-19-32

DEVELOPMENT OF FLOOD-RESISTANT ARCHITECTURAL DESIGN PROPOSALS ON AMASYA YALIBOYU HOUSE AND ITS SURROUNDING

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Abstract
Introduction: Calamities, which are characterised as natural disasters, constitute a major problem on a global scale in terms of causing loss of both life and property. Although disaster risk reduction activities have been carried out in many countries, they still cause great losses. Turkey, as a country where many natural disasters have occurred and large-scale damages have occurred, still has problems in disaster management. **The purpose of the study:** The study aims to develop architectural design proposals to prevent a possible flood disaster in the context of the historic Yalıboyu house in Amasya, Turkey, in accordance with the principles outlined by FEMA and other organizations. While presenting the proposals, the height of the flood waters and the cultural characteristics of the historical texture were taken into consideration and it was tried not to damage the historical texture. **Material and Method:** In the flood-resistant building design, the principles of organizations such as FEMA, DSI, and AFAD were investigated, design solutions based on the acquired data were discussed in detail through an important historical structure and its surroundings located in the city of Amasya, Turkey. **Results:** The city of Amasya, located in the north of the country, has struggled with many natural disasters and suffered losses in the past. According to the 50, 100 and 500 year recurrence flood hydrograph, major floods are predicted to occur in the city. Considering that these floods may cause loss of life and property, it is important to take architectural measures and especially Yalıboyu houses, which stand out with their historical texture, under protection. In this historical texture, which is in direct contact with the Yeşilırmak River, suggestions were the first presented in the context of the building environment, and then architectural solutions were gradually developed based on the rise of flood waters at the building scale. Recreation areas that can form reservoirs and basins for undefined and empty areas, permeable materials for vehicular and pedestrian paths, raising the lower level of windows for buildings without high entrances and the use of barriers for doors are proposed for the building surroundings. At the building scale, measures were taken at the first stage by providing permeability with green walls with drainage systems at the points of the first contact with flood waters. In the following stages, flood barriers, flood-resistant building materials, basement fill and flood openings were used to prevent the contact of flood waters with the building. At the same time, it is possible to achieve environmental and economic gains with the rainwater collection system proposal. **Conclusion:** The proposed solutions have been a precaution against the predicted flood risk by not disturbing the texture reflecting the history of the city. Especially in order to prevent historical buildings from being affected by disasters, evaluations should be made on the basis of each disaster and solution proposals should be presented to the municipality and administrative authorities by the relevant professional groups and implementation should be started.

Keywords: disaster; flood; architectural design.

Introduction

The rapid increase in the number of natural disasters and the large losses caused by them cause large-scale damages to both building areas and infrastructure. Especially in underdeveloped and developing countries, loss of life and property is higher and economic collapse is experienced. In developed countries, rules for minimising and preventing disaster damages are widely applied. Although the loss of life is less in these countries compared to other countries, the economic losses caused by disasters can be very high (Akın, 2018). Natural disasters and the losses they cause have not only technical but also social and economic dimensions. On a personal basis, lack of awareness, lack of importance to safety, avoiding additional costs due to economic reasons, lack of sensitivity of the architect and engineer designing the building, lack of safety concerns, ignorance and lack of education of the master constructing the building are other problems (Genç, 2007). The destructions caused by disasters do not only affect the country where the disaster occurred or the nearby geography, but can also create negative results on a global scale. For this reason, transboundary effects of disasters have been emphasised in recent years and for this reason, they are handled in regional and global context. Today, disaster strategies and policies are being implemented in many countries and the concept of risk reduction is being addressed.

In Turkey, the disaster management system and the importance given to disasters changed after the 1999 earthquake (Akın, 2018).

Being prepared and reducing possible damages in the struggle against disasters has become the priority policy of today's world and Turkey's. For this purpose, firstly, current situation analyses should be made and then integrated disaster risk elements should be determined and both the elements to be considered while building new construction areas and structures should be determined and the improvement policies to be made over the current situation should be decided (Altuntaş, 2023).

Droughts, floods and similar disasters as an integral part of nature since time immemorial, It causes continuous and significant loss of life and property. Soils are being used more intensively with unfavourable agricultural methods, forests and pastures are being destroyed, and under all these conditions, floods and flood disasters are becoming more and more frequent (Yaşar Korkanç and Korkanç, 2006). Flood is a natural hazard that easily turns into a disaster and causes great loss of property and life in Turkey as in almost every part of the world. The occurrence, magnitude and extent of damages caused by floods are directly related to the climatological-meteorological, geological-geomorphological, biological characteristics and various activities of people (Ozcan, 2006).

In order to minimize the negative effects of disasters and emergencies, various qualified studies should be carried out before the disasters (Sarı, 2022). Organizations such as FEMA (Federal Emergency Management Agency) in the United States, DSİ (Turkiye State Hydraulic Works) and AFAD (Turkiye Disaster and Emergency Management Presidency) in Turkey carry out many studies for measures to be taken against floods and other disasters and post-disaster recovery plans. FEMA emphasizes disaster sensitivity by stating that one of its main goals is to prevent and reduce losses from natural hazards (FEMA, 2013). AFAD, on the other hand, states that until recent years, crisis management-oriented studies and investments have been predominant in Turkey, and that response to disasters and subsequent recovery efforts have been at the forefront (AFAD, 2021). In the Yeşilırmak Basin Flood Management Plan prepared by DSİ, disaster management is defined as all of the analysis, planning, decision-making and evaluation processes that organize existing resources for the purposes of preparedness, mitigation, response and recovery against all kinds of hazards that may be caused by floods (DSİ, 2015).

Within the scope of the study; in line with the data obtained as a result of AFAD and DSİ studies, the flood disaster, which can cause a great deal of damage but can be prevented with the measures that can be taken, is examined through the Yalıboyu houses of Amasya province. After discussing the general characteristics of the city, architectural design proposals are presented on the historical building and its surroundings, which have the common characteristics of the historical buildings in the study area, in a way that does not harm the originality of the historical texture of the building. The recommendations were developed based on the studies of FEMA and other organizations on the flood disaster.

The Disaster Susceptibility of Amasya

Amasya province is located in the northern part of Turkey (Fig. 1), in the central part of the Black Sea region, between 34º 57'–36º 31' east longitude and 41º 04'–40º 16' north latitude (Türkoğlu, 2006). Located in the Yeşilırmak basin, the main branches

Fig. 1. Location of Amasya province in Turkey (Google Earth)

of Yeşilırmak pass through the center of the city. In addition, since it is surrounded by high mountains, the surface shapes are rugged and the city center is in a narrow area (Ateş, 2019).

Since Amasya is located in the Yeşilırmak basin, the waters carried by the tributaries of Yeşilırmak have caused floods due to climatic reasons in the past years (AFAD, 2021). In the Yeşilırmak Basin Flood Management Plan reported by DSİ (Turkiye State Hydraulic Works), two-dimensional hydraulic modeling was carried out in the flood-prone areas and the spreading area, water depth and water velocity corresponding to different recurrence flows were calculated. Three flood scenarios were simulated using 1D/2D models. Based on the hydrological model analysis, iterative hydrographs of Q50, Q100, Q500 were obtained (Fig. 2). Based on these hydrographs, flood hazard map was created. For the 50-year recurrence flood, no flood occurs in Amasya. For the 100-year recurrence flood, some flooding occurs upstream of the province. The depth of the flood reaches 1 to 1.5 metres and covers 5.3 hectares. For the 500-year recurrence flood, a serious flooding event occurs in the upstream part of the province as well as outside the city in the upstream direction. The flood depth is 2 metres and covers an area of 194 hectares (DSİ, 2015).

It is thought that climate change causes an increase in the number and severity of disasters and this increase will continue in the future. Experts emphasizing the importance of keeping global warming below 1.5 °C until 2030 think that otherwise the disasters experienced today will be much more effective (Gökmen Erdoğan, 2022).

In Amasya, the highest amount of precipitation falls in the spring season and the total annual precipitation is 461.6 mm. The highest precipitation is in May with 53.8 mm and the lowest precipitation is in August with 10.1 mm (Fig. 3). In terms of flood risk, April, May and December can be classified as very risky; January, March and November as risky; July and August as less risky. It should be taken into consideration that the risk of flooding may be at a high level especially in very risky months and precautions should be increased in these months.

Case Study

Yalıboyu houses in Hatuniye neighborhood of Amasya, which are under risk in the 100-year and 500-year recurrent flood report, were selected as the work area (Fig. 4). Yalıboyu houses, which stand out

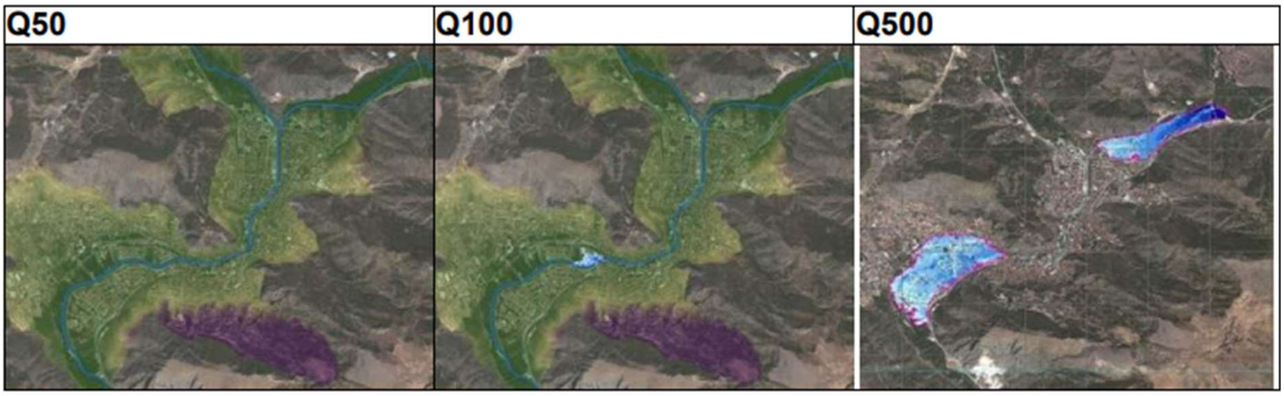


Fig. 2. View of flood hazard maps for Amasya for 50,100, 500 year recurrence periods (DSİ, 2015)

AMASYA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Measurement Period (1961-2022)											
Average Temperature (°C)	2.6	4.5	8.3	13.4	17.6	21.3	23.8	23.9	20.0	14.6	8.5	4.6
Average Maximum Temperature (°C)	7.0	9.8	14.5	20.4	25.1	28.7	31.1	31.5	27.9	21.9	14.6	8.8
Average Minimum Temperature (°C)	-0.8	0.3	3.1	7.2	11.1	14.5	16.7	16.7	13.0	8.7	3.9	1.3
Average Sunshine Duration (hours)	2.2	3.3	4.5	6.0	7.4	8.8	9.6	9.2	7.5	5.0	3.4	2.1
Average Number of Rainy Days	12.34	11.08	12.48	12.02	12.98	9.05	3.27	2.66	4.74	7.92	9.16	12.56
Average Monthly Total Rainfall (mm)	51.1	37.2	48.1	53.4	53.8	40.1	16.2	10.1	19.7	34.5	42.7	54.7
	Measurement Period (1961-2022)											
Maximum Temperature (°C)	23.5	24.8	31.2	35.8	37.9	41.8	45.0	42.2	43.5	36.0	29.7	22.9
Minimum Temperature (°C)	-21.0	-20.4	-15.5	-5.1	-0.1	4.8	8.5	8.8	3.0	-2.9	-9.5	-12.7

Fig. 3. Long-term average monthly precipitation table of Amasya (General Directorate of Meterology)

Fig. 4. Study area and its surrounding (Türkoğlu, 2006)

with their traditional texture, are located in the north of Yeşilırmak. The mountains rising behind the river, castle ruins and king rock tombs have formed the remarkable texture of the region. Another historical building in the region is the Alçak Bridge. The bridge provided a connection between the river and the opposite part of the city (Ateş, 2019).

Although the architecture destroyed by disasters in Amasya province has been replaced by new buildings, traces of traditional architecture can be seen intensely. One of the most unique examples of traditional civil architecture is Yalıboyu Houses. Yalıboyu is the residential area between the Station Bridge and the Government Bridge, north of Yeşilırmak. There are homogenously many Local Amasya Houses in the region (Güzelci, 2012).

Flood Resistant Design Proposals for the Built Environment

Most of the buildings in the region are located parallel to the river. Therefore, they were built in adjacent order (Ateş, 2019). Apart from the building areas, there are green areas, playgrounds, empty building parcels, empty undefined areas, roads and squares (Türkoğlu, 2006). For a flood-resilient urban planning, recreational areas are proposed to be used as regulatory reservoirs in undefined and vacant lands and as basins in case of flooding (Fig. 5).

Recreation areas can be designed as basins where water can accumulate at certain points in city centers to drain flood waters and be used when needed. The storage of flood waters in various forms in reservoirs on their way to the receiver can be used today as one of the most comprehensive protection measures of flood regulation effects that reduce flood water flow rate, width of flooded area, timing, etc. (Kadıoğlu, 2019).

Although the study area is not within the main transportation axes, the transportation flow is intense (Ateş, 2019). There are three types of road typologies: the first degree vehicle roads, the second degree vehicle roads and pedestrian roads. Although Ziya Paşa Boulevard, which is the first-degree road, is wide, it cannot meet the traffic load of the area and traffic congestion is experienced. On the second-degree roads, there is no ease of transportation due to the narrowness of the roads. At the same time, narrow sidewalks create insecurity for pedestrians. In case of a possible flood, roads pose a threat as they increase the flow rate of water.

The lack of water-permeable soil and materials makes cities particularly vulnerable to floods that can occur very quickly and at a point scale (Kadıoğlu, 2019). In the field of study, use of permeable materials is recommended for both vehicular and pedestrian roads. Flood resistance at the urban scale can be provided with permeable asphalt (Fig. 6, c) on the primary vehicular road, permeable stone (Fig. 6, a) on the secondary vehicular road to integrate with the historical texture, and permeable stone (Fig. 6, d) on the pedestrian road to incorporate the green texture. At the same time, the inadequacy of manhole covers used in all transportation arteries makes it difficult to drain flood waters. Super or combined manhole covers can be used to prevent this problem (Fig. 6, b).

The majority of Yalıboyu Houses in the study area have basement floors. Basements are one of the first areas to be penetrated by flood waters in case of a possible flood. Therefore, the measures to be taken on the basement floor surfaces are important in terms of flood resistant design principles.

Flood protection measures can be taken by raising basement windows above the base water level (Fig. 7, b) determined by at least 100-year flood waters. Similarly, a waterproof cover (Fig. 7, a) can be installed on the door of buildings with zero entrance or entrance below the base water level to prevent the building from being flooded to a great extent (Kadıoğlu, 2019).

Within the scope of the study, the building in Hatuniye Neighborhood, which has the characteristics of Amasya Yalıboyu Houses and which is thought to be the first to be affected in case of a possible

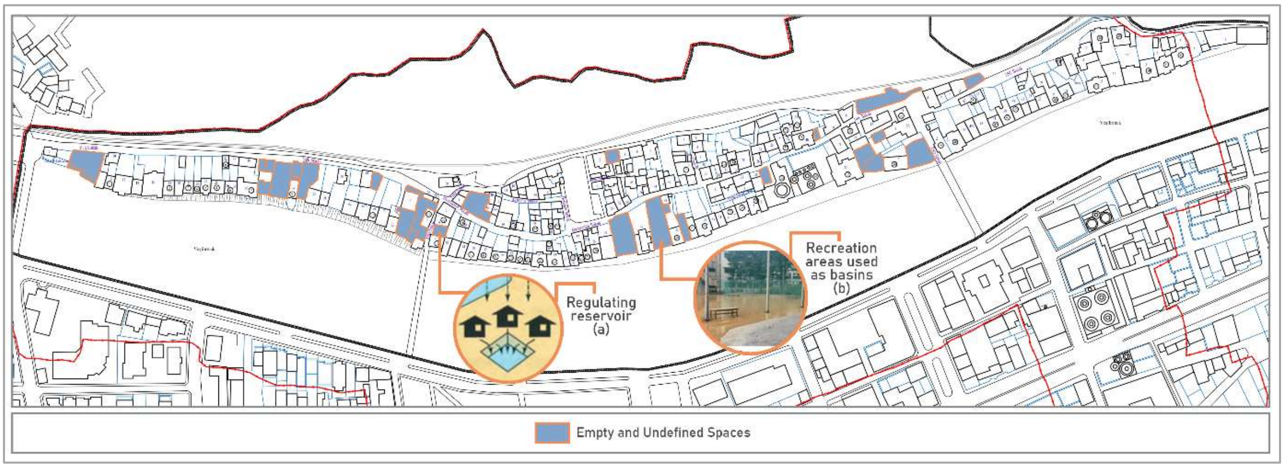


Fig. 5. Empty and undefined spaces — design proposals (Türkoğlu, 2006) (Edited by authors): a —Regulating reservoir (Kadıoğlu, 2019); b — Recreation areas used as basins (Ikeuchi, 2012)

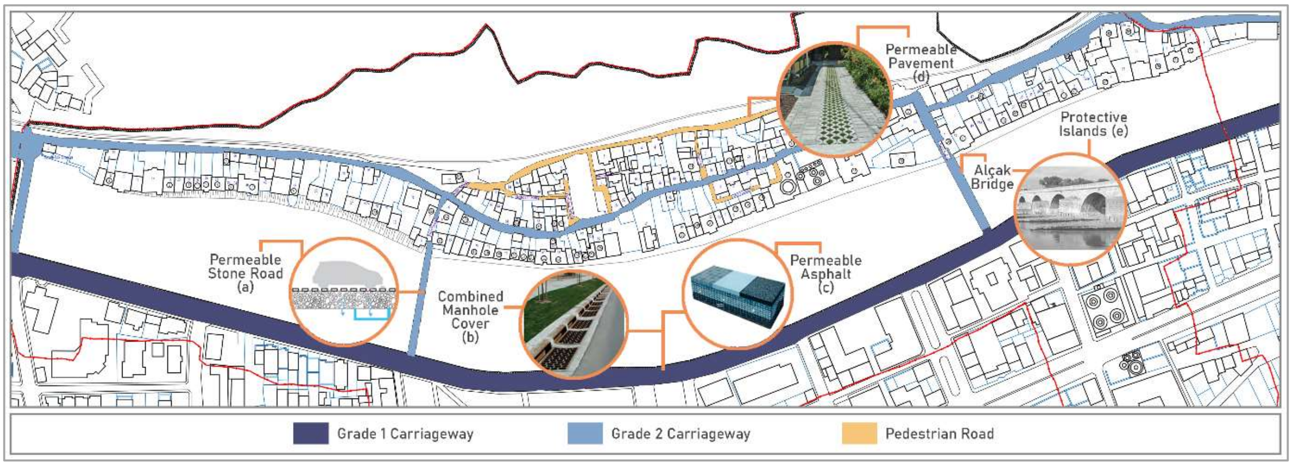


Fig. 6. Transportation arteries-Design proposals (Türkoğlu, 2006) (Edited by authors) [a) Permeable stone road (Al, 2018), b) Combined manhole cover (Kadıoğlu, 2019), c) Permeable asphalt (Philadelphia Water Department), d) Permeable pavement (Al, 2018)]

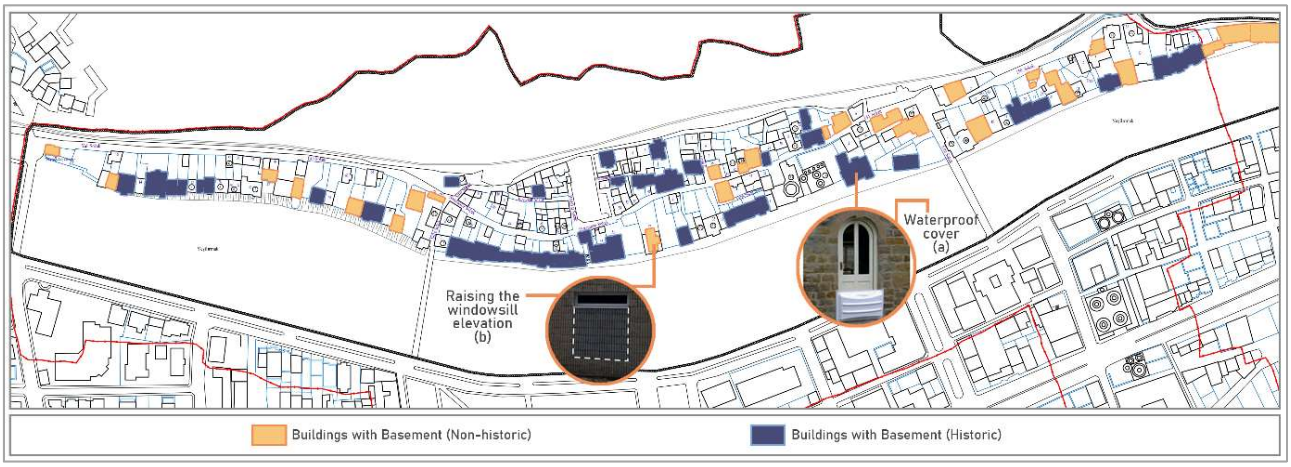


Fig. 7. Buildings with basements and zero entrance — Design proposals (Türkoğlu, 2006) (Edited by authors): a — Waterproof cover (Kadıoğlu, 2019); b — Raising the windowsill elevation (Kadıoğlu, 2019)

flood, was selected (Fig. 8). The selected building is functionalized as a boutique hotel-museum. Hatuniye Mosque and the building functioning as a restaurant are located in the neighborhood of the building. At the same time, the Kral Kaya Tombs are located behind it.

The studied building (Fig. 9, a) is a traditional building on the historical city wall on the edge of Yeşilırmak, which is arranged as two floors over the basement (Fig. 9, b). The building is arranged with mudbrick filling between wooden roofs and is used as a museum-house today. The north and west facades of the building protrude outwards and provide mobility in the building. Guillotine windows are seen in groups of three on all facades except the east facade. The building, organized in the Haremlik-Selamlik style, was built in the plan type of a central room (Yüce, 2001).

Flood Resistant Design Proposals at Building Scale

The study area is located adjacent to Yeşilırmak. It is one of the areas that may experience the greatest impact in a possible flood disaster. When the area analyses are examined, there are negativities such as excessive building stock, narrow streets, inadequacy of the drainage system. These were also taken into consideration when proposals were made at the building scale. The historical building with 2 floors and a basement, which has the characteristics of Yalıboyu Houses and which is functioned as a boutique hotel-museum with a lower elevation compared to other buildings, was selected as the building to be proposed. Architectural measures that can be taken against flooding in the building are discussed in line with

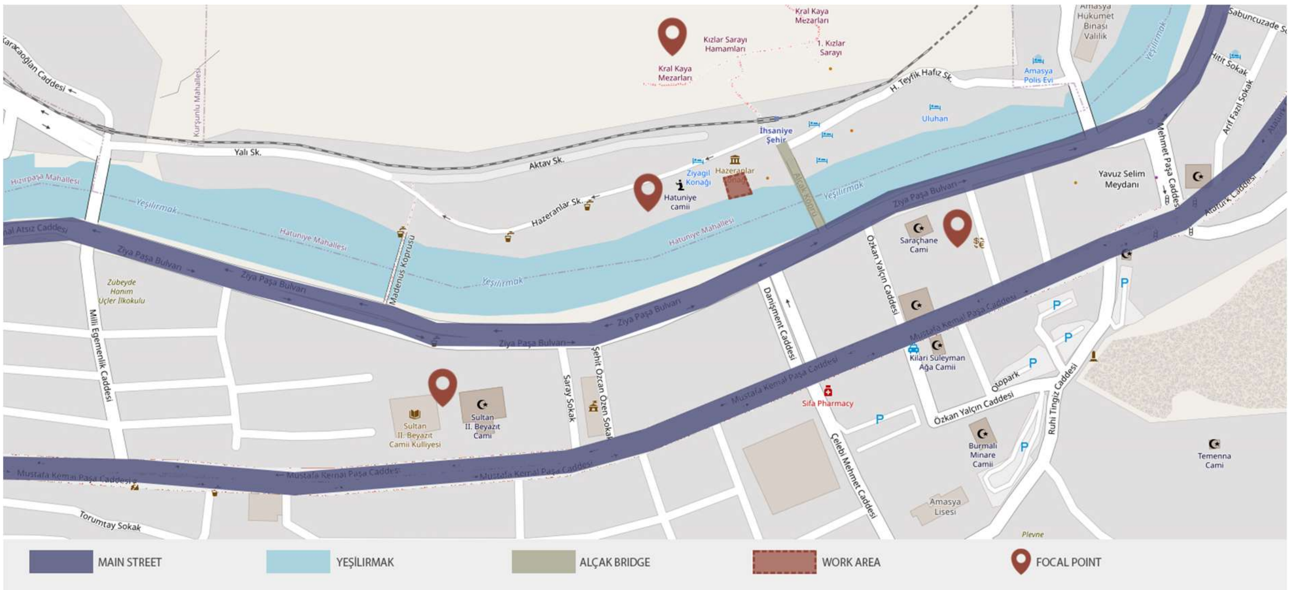


Fig. 8. The building and its surroundings (Google Earth) (Edited by authors)

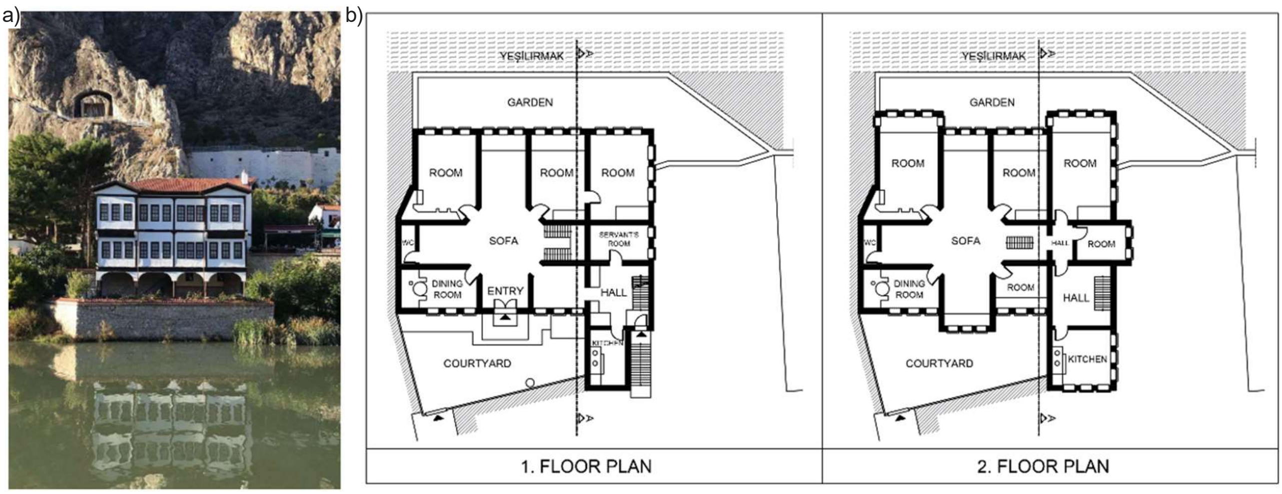


Fig. 9. Studied building (a) (Author archive) and floor plans (b) (Ministry of Culture and Tourism, 2021) (Edited by authors)

the principles adopted by organizations such as FEMA (Federal Emergency Management Agency), DSI (Turkiye State Hydraulic Works) and AFAD (Turkiye Disaster and Emergency Management Presidency). The proposals have been developed with the aim of preserving the historical texture with aesthetic concerns.

Stage 1: Green Wall Design and Evacuation Drainage

Planting of building surfaces makes significant contributions to urban ecology due to its functions such as protecting buildings, providing climatic comfort, improving environmental conditions and reducing some environmental problems, as well as aesthetic and visual contributions at both urban and single building scales. It also provides benefits by collecting possible flood waters and conveying them to the drainage channel (Tokatlı, 2021).

In the situation that the flood waters rise more than 1 metre on the courtyard wall located on the façade of the building facing Yeşilırmak, it is recommended to design a green wall in the first stage and to make the water permeation by the green wall (Fig. 10). The flood waters can be transferred to the drainage system through the drainage channels of the wall. Although this system is costly in terms of establishment, it is less costly in terms of maintenance. It can also be preferred due to its aesthetic appearance. With this design, flood waters are prevented from overcoming the wall in the first stage.

Large-scale flood disasters can be prevented by building a separate drainage system against flooding (FEMA, 2015). In cases where the capacity of the green wall is exceeded and the flood height exceeds 1.5 metres, it is recommended that the flood waters be conveyed to the sewer via an evacuation drainage (Fig. 10). The drain used can be activated automatically or manually only in case of flooding.

Stage 2: Flood Barrier and Drainage Pump

Flood barriers that resist high hydrodynamic forces to reduce the threat to people and structures in flood-prone areas are another proposal. Barriers can be temporary and permanent, as well as successively placed in various locations (Rappazzo and Aronica, 2016). In case the flood depth exceeds 2.5 metres, a flood barrier with an opening-closing system made of tempered glass on the wall facing the river is proposed as a precautionary measure (Fig. 11). The proposed flood barrier can be designed to open during the flood and close afterwards. In case the flood waters exceed the flood barrier, it is proposed to collect them in the drainage raceway covered with permeable material in the courtyard and return them to the river with a drainage pump.

Stage 3: Flood Resistant Materials

The risk of damage differs according to the sensitivity of the materials used in the construction system to water and the way they are used in the building (masonry, carcass, etc.). For example, materials such as wood, which absorb water quickly and deteriorate due to the development of harmful organisms if not properly dried in contact with water, and construction systems containing these materials have a higher risk of flood damage (Gökmen Erdoğan and Gül Unal, 2021).

It is recommended to use metal as door material on building surfaces that may be exposed to flood waters. The use of glass block bricks for window openings creates resistance against flooding. In the interior, it is recommended to cover the wall surface with non-paper faced plasterboard. On the floor, terrazzo tiles can be used to prevent flooding (FEMA, 2015). In the event that flood waters enter

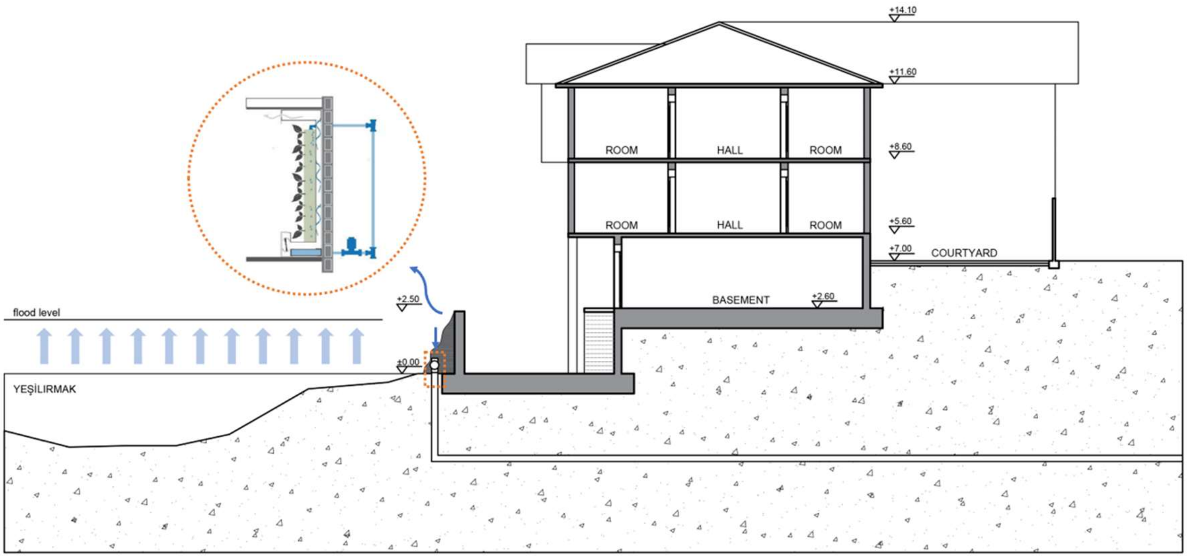


Fig. 10. Green wall design and evacuation drainage (Drawn by the authors)

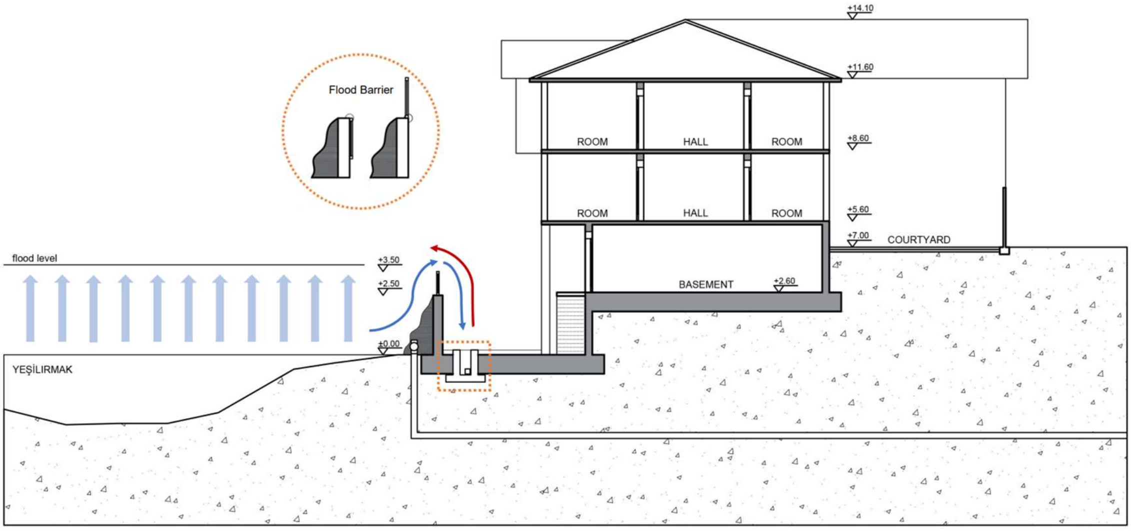


Fig. 11. Flood barrier, drainage raceway and pump (Drawn by the authors)

the garden, the wooden pillars in the courtyard of the building are not resistant to flood waters. It is recommended that these posts be covered with a flood-resistant wood oil or metal sheet. At the same time, it is considered appropriate to use a barrier door at the basement door (Fig. 12).

State 4: Basement Backfill and Flood Openings

Floors below the BFE (Base Floor Elevation) level can be filled with construction fill material and the walls above the ground can be reinforced with flood openings. Flood waters can be prevented from entering the structure with automatically opened flood openings placed below the BFE level (FEMA, 2015). In case the flood waters exceed 5 m, it is recommended to cancel the use of the basement floor and fill the courtyard with filling material up to the ground level in order to prevent flood waters from entering the building (Fig. 13). In case of a possible flood, flood openings are proposed to be constructed in the basement walls above the ground level, and in case of a possible flood, the water is proposed to enter through the flood openings and transfer to the garden without entering the building. In the garden, it is possible to remove the water with evacuation drainage.

Stage 5: Rainwater Harvesting System

In today's world where water is important, it is known that only 30 per cent of the rainwater falls into the groundwater and the amount of rainwater that cannot be utilized is very large. Considering that water prices are increasing in line with the importance of water, collecting, storing and utilizing rainwater is both an economic gain in terms of environment and water resources. Nowadays, the use of potable municipal water for irrigation water needs, which reaches significant amounts, is an important problem both environmentally and economically

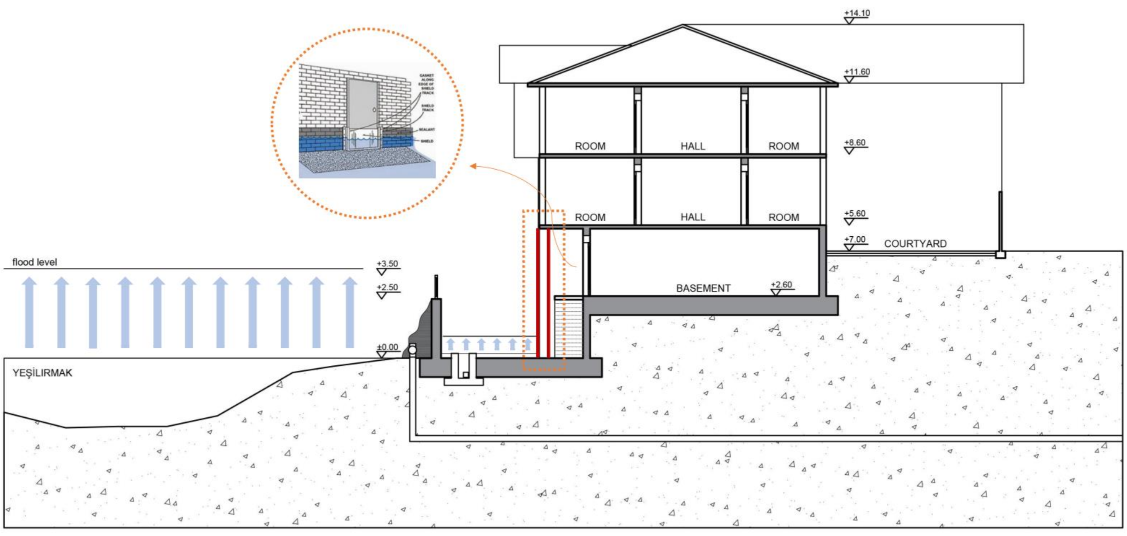


Fig. 12. Coating with flood resistant material (Drawn by the authors)

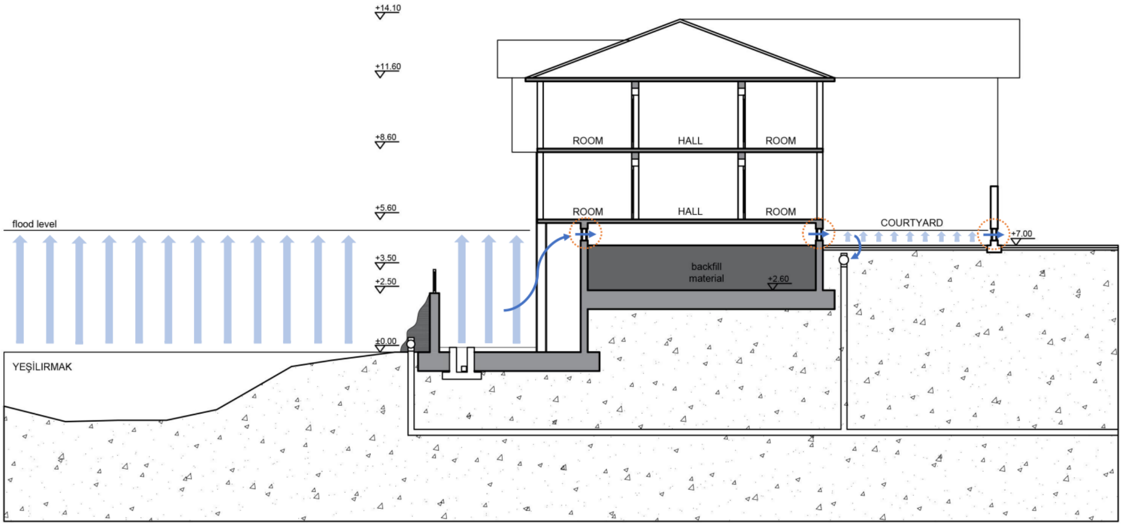


Fig. 13. Basement backfill and flood openings (Drawn by the authors)

(Yalılı Kılıc and Abus, 2018). A rainwater harvesting system is a method of collecting rainwater and storing this free rainwater in a tank before reusing it for a specific purpose. This system is widely used in most regions of the world that are suitable for local climatic conditions. Rainwater harvesting is typically used for domestic use, agriculture and environmental management. Rainwater harvesting to provide water for domestic purposes is a common practice in developing countries, especially in arid and semi-arid regions affected by water scarcity, but also in urban areas (Temizkan and Tuna Kayılı, 2021). This system is also proposed for the studied building against the drought, which shows its effect more and more every day. By installing a rainwater storage system in the cancelled basement floor, environmental and economic gains are achieved (Fig. 14). At the same time, it contributes to the re-functionalization of the vacated basement floor. Although the system is expensive in our country, it is important in terms of usefulness.

Evaluation

Within the scope of the study, Yalıboyu houses representing the traditional fabric of Amasya were analyzed and architectural design proposals were presented through the building and its surroundings (Table 1). Basins (recreation areas) and reservoirs were designed in undefined areas to be used in case of possible flooding in the city, aiming to control flood waters. Based on the intensity of use and location of the transportation arteries in the study area, design proposals were presented to resist flooding. Permeable asphalt is proposed for the first level vehicular road, permeable stone for the second level vehicular road and permeable stone material for the pedestrian road. At the same time, manhole covers

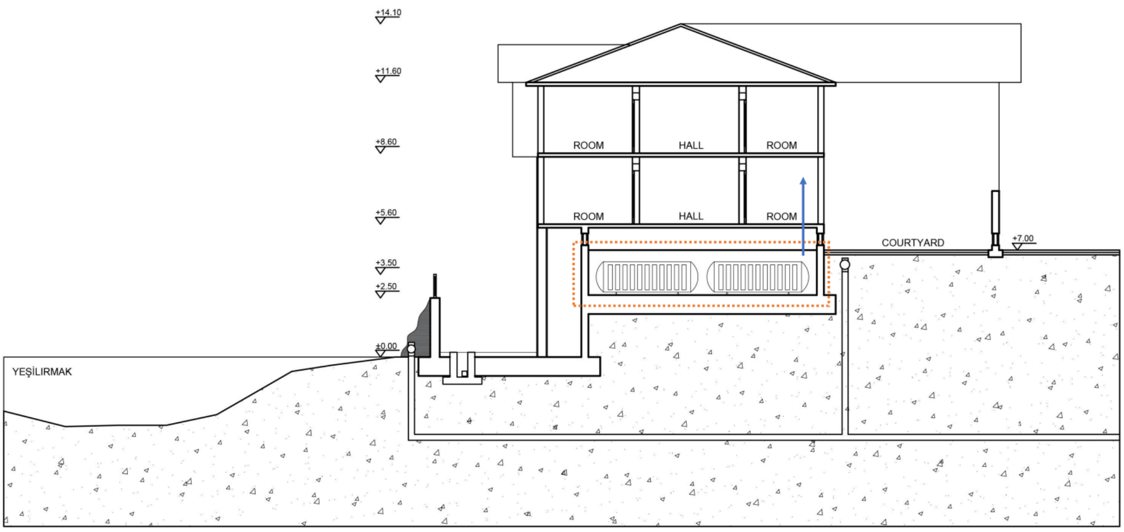
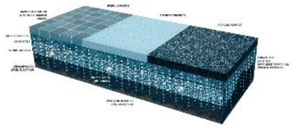
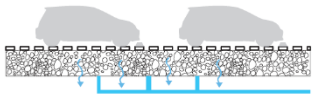


Fig. 14. Rainwater harvesting system (Drawn by the authors)

Table 1. **Proposals against flooding for the building surroundings**

FIELDS	ISSUE	SOLUTION PROPOSAL	SOLUTION PROPOSAL IMAGE
Empty and Undefined Spaces	Inadequacy of flood water storage areas	Recreation areas used as basins	 See Figure 5 (b) (Ikeuchi, 2012)
		Regulating reservoir	 See Figure 5 (a) (Kadıoğlu, 2019)
Transportation Arteries	Not using water-permeable materials	Permeable asphalt	 See Figure 6 (c) (Philadelphia Water Department)
		Permeable stone road	 See Figure 6 (a) (Al, 2018)
		Permeable pavement	 See Figure 6 (d) (Al, 2018)
	Inadequate manhole	Combined manhole cover	 See Figure 6 (b) (Kadıoğlu, 2019)
Buildings with Basements and Zero Entrance	Doors and windows below the flood water level	Waterproof cover	 See Figure 7 (a) (Kadıoğlu, 2019)
		Raising the windowsill elevation	 See Figure 7 (b) (Kadıoğlu, 2019)

were found to be inadequate in all transportation networks and super or combined manhole covers were proposed as a solution to this problem. Another problem in the area is that most of the historic buildings have basements or no raised entrances. As a solution to this problem, it is suggested that the lower elevation of the window be raised above the base water level determined by at least 100 years of flood waters. For the doors, flood resistance with barriers was considered.

In the second stage of the study, flood resistant design proposals were presented based on the flood level (Table 2) on the building that has the common characteristics of Yalıboyu Houses. Yalıboyu houses, which attract attention with their historical texture, are located in a neighbouring

Table 2. **Solution proposals against flooding**

	Flood Level	Proposal
Stage 1	1–1.5 m	Green Wall Design and Evacuation Drainage
Stage 2	1.5–2.5 m	Evacuation Drainage
Stage 3	> 2.5 m	Flood Barrier and Drainage Pump
Stage 4	0–5 m (inside the courtyard)	Flood Resistant Materials
Stage 5	> 5 m	Basement Backfill and Flood Openings
Stage 6	–	Rainwater Harvesting System

location to Yeşilırmak and are the building group that may be affected in case of a possible flood. The high density of buildings, narrow streets and inadequacy of the drainage system increase the extent of the disaster.

In line with the principles adopted by FEMA (Federal Emergency Management Agency) and other organizations in the historical building, which has the characteristics of Yalıboyu Houses and whose elevation is lower than the other buildings, it is proposed that in the event that the flood level exceeds 1 meter, the flood waters should be transmitted to the drainage system with the green wall system and transferred to the drainage system with the drainage channels of the system. With this system, flooding can be prevented at the first stage and aesthetically integrated into the historical structure. The drainage system, which can be activated automatically or manually in case the flood level exceeds 1.5 meters, is also proposed considering the exceeding capacity of the green wall. In the second stage, in case the flood level exceeds 2.5 metres, a flood barrier made of tempered glass with an opening-closing mechanism is proposed on the garden wall that interacts with the river. With this system, the historical texture is not damaged and glass material which is thought to be compatible is used. In case the flood waters exceed the barrier, a drainage raceway covered with permeable material and a drainage pump that returns the water collected in this channel to the river is proposed in the garden. The majority of the building is made of wood, which absorbs water quickly and deteriorates in contact with water. Considering the risk of contact with the building elements in case the flood waters rise up to 5 metres above the garden floor, in the third stage; it is proposed to cover the wooden posts in the garden with wood oil or metal sheet. For the wooden basement door, use of a barrier door was deemed appropriate. As the fourth stage, in case the flood level exceeds 5 meters, it is deemed appropriate to cancel the basement floor and fill it with filling material up to the courtyard floor in order to prevent flood waters from entering the building. Flood openings are designed in the basement walls above the ground level, and in case of a possible flood, it is proposed to transfer the water to the garden through the flood openings without entering the building. It is possible to use a drainage system for the water accumulated in the garden. Finally, a rainwater harvesting system is proposed in the basement floor, which was cancelled in response to the drought disaster, which is becoming more and more effective every day in the world and in Turkey. Thus, the basement floor has been functionalized and a rainwater storage system has been installed to provide environmental and economic gains. With all these proposals, aesthetic and practical solutions are offered against possible flood disasters.

Conclusion

Natural disasters, which cause major structural damages in settlements and infrastructures, cause economic collapse as well as loss of life and property. The destructions caused by disasters can cover not only the geography where they occur, but also the surrounding geographies and cause disasters on a global scale. One of the disasters that have caused many losses from past to present is flood disaster. Many negativities such as unconscious use of agricultural lands, human errors, destruction of forests have brought flood and flood disasters. Floods can occur almost anywhere in the world, but the probability of occurrence in Turkey is very high, especially with the effect of drought and global warming. Amasya, which has experienced and is likely to experience many flood disasters in the past, has been examined within the scope of the study.

Amasya stands out with its topographical aspect and historical process. Flooding is seen as a major threat when the disaster situation is considered. In the past years, many flood disasters have occurred with the overflow of Yeşilırmak basin, causing loss of life and property. The DSI (Turkiye State Hydraulic Works) report states that flood disasters may occur in Amasya province according to the 50, 100 and 500 year recurring flood hydrograph.

In line with the data obtained, architectural design suggestions that will increase the flood resistance of the buildings are presented through Yalıboyu House and its surroundings. While presenting the proposals, the building stock, historical texture and geographical features in the study area were taken into consideration. Many buildings in the study area are historical buildings and have common characteristics with the building in the studied area. For this reason; the proposals are important not only for a single building, but also for other buildings in the area and their applicability is considered high.

In the studies conducted by FEMA and other organizations, there are different flood-resistant building design principles and proposals in different countries. While examining the measures to be taken against flood disasters, the structure and geographical characteristics of the city to be applied should be well analyzed and appropriate proposals should be developed. Evaluations should be made not only from an architectural point of view but also by other professional groups and joint studies should be carried out. The studies should be supported and implemented by municipalities and other administrative authorities.

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РАЗРАБОТКА ПРЕДЛОЖЕНИЙ ПО ПРОТИВОПАВОДКОВОМУ АРХИТЕКТУРНОМУ ПРОЕКТИРОВАНИЮ ДОМА ЯЛИБОЮ В Г. АМАСЬЯ И ЕГО ОКРЕСТНОСТЕЙ

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Аннотация
Введение. Катаклизмы, которые характеризуются как стихийные бедствия, представляют собой серьезную проблему в глобальном масштабе, поскольку приводят к человеческим жертвам и материальным потерям. Несмотря на то, что во многих странах проводятся мероприятия по снижению риска стихийных бедствий, они по-прежнему приводят к большим потерям. Турция, как страна, где произошло множество стихийных бедствий и был нанесен крупномасштабный ущерб, все еще испытывает проблемы в управлении стихийными бедствиями. **Цель исследования:** разработать предложения по архитектурному дизайну для предотвращения возможного наводнения в контексте исторического дома Ялыбою в г. Амасья, Турция, в соответствии с принципами, изложенными FEMA и другими организациями. При разработке предложений учитывались высота паводковых вод и культурные особенности исторической структуры рельефа, при этом старались не повредить историческую структуру. **Материалы и методы.** При проектировании сейсмостойких конструкций были изучены принципы таких организаций, как FEMA, DSI и AFAD, а проектные решения, основанные на полученных данных, были подробно обсуждены на примере важного исторического сооружения и его окрестностей, расположенных в городе Амасья, Турция. **Результаты.** Город Амасья, расположенный на севере страны, в прошлом не раз сталкивался со стихийными бедствиями и нес потери. Согласно временному графику наводнений за периоды 50, 100 и 500 лет, в городе прогнозируются крупные наводнения. Учитывая, что эти наводнения могут привести к человеческим жертвам и материальным потерям, важно принять архитектурные меры и особенно взять под защиту дома Ялыбою, которые выделяются своей исторической фактурой. В этой исторической структуре, которая находится в непосредственном контакте с рекой Еши́льырма́к, сначала были представлены предложения в контексте строительной среды, а затем постепенно были разработаны архитектурные решения, основанные на подъеме паводковых вод в масштабе здания. В окрестностях зданий предлагается создать зоны отдыха, которые могут стать резервуарами и бассейнами для неопределенных и пустующих территорий, использовать проницаемые материалы для автомобильных и пешеходных дорожек, поднять нижний уровень окон зданий без высоких входов и использовать барьеры для дверей. В масштабах здания на первом этапе были приняты меры по обеспечению водопроницаемости с помощью вертикальных садов с дренажными системами в местах первого контакта с паводковыми водами. На последующих этапах для предотвращения контакта паводковых вод со зданием использовались барьеры от наводнений, устойчивые к наводнениям строительные материалы, засыпка подвалов и обустройство проемов от наводнений. В то же время, предлагая систему сбора дождевой воды, можно добиться экологических и экономических преимуществ. **Выводы.** Предложенные решения являются мерой предосторожности против прогнозируемого риска наводнения, не нарушающей структуру, отражающую историю города. Специально для того чтобы исторические здания не пострадали от стихийных бедствий, необходимо проводить оценку каждого стихийного бедствия, представлять предложения по решению проблемы муниципалитету и административным органам соответствующими профессиональными группами и приступать к их реализации.

Ключевые слова: стихийное бедствие; наводнение; проектирование зданий.