

歴史都市防災論文集 Vol.16 掲載論文・報告一覧

【論文】

1. 輪島市黒島地区のワクノウチ建築物の耐震性能

A Study on Seismic Performance of Traditional Wooden Buildings in the Kuroshima Area of Wajima City

須田達

A detailed structural investigation and seismic performance evaluation were conducted on traditional wooden houses in the Kuroshima area of Wajima City. The traditional wooden houses in this area, which was selected as an important preservation district of groups of historical buildings in 2009 were built with a characteristic plan and a unique structure called Waku-no-uchi. Seismic performance was evaluated based on the collapse of the whole building and the behavior of each structural part. Based on the results of the study, it was clarified that the column buckling and the column base sliding, therefore the risk of collapse of the Waku-no-uchi structure due to an earthquake was pointed out.

2. 柔床立体建物に対する合理的な連結制震装置の設計法

Study of Rational Design Method for Connecting Vibration Control System for Soft Floor Building

吉富信太, 中西裕也

This study examines the application of a connected vibration control system to traditional wooden buildings, which can suppress seismic response with little modification to the interior or main structure of the building. In this study, a new method is proposed to determine the optimal damper performance and placement for structural model with soft floor. By using this method, the effect of the floor stiffness on the optimal performance and placement of connected damper is examined through two numerical example models which have substructures inside or outside of the main building.

3. 楔なし通し貫接合部の貫に生じるひずみ分布の画像計測

Strain Distribution of Nuki-Column Joint Using Digital Image Correlation

井上祥子, 村本真

This paper illustrates the progress of the strain distribution of Nuki-column joints using image analysis by the digital image correlation method. In the cyclic loading tests of the Nuki-column joints, the Nuki was moved to the front for image measurement, and compressive displacement of perpendicular to the grain and the strain distribution were recorded without the effect of friction. The results of the image analysis show that the range of the compressive strain region is the width of the column and that the elastic range is generally less than 1/30 rad. It is also illustrated that the distribution shape of the elastic-plastic strain differed from that of the elastic strain.

4. 別府市鉄輪の空き家活用における wallstat の有効性に関する研究

Research on the Effectiveness of Wallstat in Utilizing of Vacant Houses at Kannawa in Beppu City

木村智, 坂本昇陽, 平尾和洋

This case study focuses the effectiveness of the “wallstat” for re-use of vacant houses around Kannawa district, Beppu city. Leaving vacant houses untouched can cause secondary disasters such as blocking evacuation routes in areas with many narrow alleys such as Kannawa area. The purpose of this paper is to make seismic diagnosis using wallstat, to examine an efficient seismic plan, and to consider whether the simulation software is effective in utilizing vacant houses. Furthermore, this paper clarifies the problems and issues when actually performing seismic retrofitting and utilization.

**5. 話題カテゴリを用いた流域治水シナリオ作成ワークショップの分析
—歴史都市京都府亀岡市における保津川流域を事例として—**

Analysis of the Scenarios Workshop Using “Topic Categories”: Case Study on a Workshop in Kameoka City, Kyoto Prefecture

阿部俊彦, 武田史朗, 萩智隆, 山口敬太, 中島秀明, 花岡和聖, 大野智彦

Climate change and depopulation have made it difficult to predict the future. To review existing institutions and practices for a better future in the region, we held a scenario planning workshop in Kameoka City, Kyoto Prefecture, and conducted a quantitative analysis of the process and conversation content. This research analyzed the contents of future scenarios planned by each group in a way that their intentions could be compared with each other by using “Topic Categories”. Through the analysis, the future image and the characteristics of the issues in the area were clarified.

**6. グリーン・ブルースポットを用いた流域全体での洪水調節機能評価
—京都府亀岡市の支流域をケースとした試行的解析—**

Evaluation of Flood Control Function in Inland Using Green Blue Spots

-A Case Study Focusing on Tributary Areas in Kameoka City, Kyoto Prefecture-

焦英楠, 武田史朗, 花岡和聖, 中島秀明, 章俊華

In this research, we focus on the basin-wide comprehensive flood disaster prevention, which has been widely recognized in recent years, instead of the conventional hydraulic control that collects and flows down as much flood as possible within the rivers themselves. To analyze the flood control ability of the basin, we proposed the concept of green-blue spot (GBS) and applied it on the DEM data using ArcGIS. As a result, the flood accommodation capacity in the entire Kameoka basin and in each of the five tributaries enabled by GBSs were clarified under tentative conditions.

7. 近世・近代の土蔵の外観と構法

Exterior Designs and Structural Features of Traditional Storehouses During the Early Edo Period and the Modern Period

吉川奎, 青柳憲昌

This paper is a study of the appearance and construction of earthen storehouses, dozo, in the early Edo and the modern periods. The dozo is a traditional fire-prevention type of architecture. The general external appearance of a storehouse is characterized by a gabled, tiled roof with short eaves, a bowl under the eaves, white plastered walls, and terraced openings with hanging lanterns to enhance airtightness and fire resistance. These characteristics are the reason why many of these houses remain in today's historic cities. The purpose of this paper is to clarify some aspects of the formation process of the storehouse architectural style seen today. The gabled and tiled roof was already a common appearance of storehouses in the early Edo period, but the shortened eaves, the hatch and the use of kakeko lacquer for doorways and windows suggest that the appearance of today's storehouses was established in the 18th century. The study also revealed that although various techniques existed in parallel from the early Edo period to the modern period, there was no significant change in the construction method of the storehouse.

8. 深層学習を用いた伝統的建造物群保存地区の街路画像の分類

Classification of Street Images of Preservation Districts for Groups of Traditional Buildings by Deep Learning

越智広樹, 山田悟史

In Japan, preservation of Japanese historical sites have been progressing. However, regarding a judgment as to whether the preservation plan is suitable or not, some people have pointed difficulties out. Therefore, the authors attempt quantitative approach to the problem by AI technology based on Deep Learning. In this study, to verify the possibility of application of the technology, the authors create street image classification AI on scene of preservation districts for groups of traditional buildings. Moreover, the authors visualize where AI looking in the image when AI classify by XAI technology. As a result, classification AI reaches high

precision and the judgment is systematic by the class, so the result show AI has the possibility of application.

9. 1946年南海地震における新宮市の火災延焼動態

Dynamics of Spreading Fire in Shingu City During 1946 Nankai Earthquake

辻原治, 尾崎嘉紀, 角希美

In the 1946 Nankai earthquake, a fire broke out in Shingu City, Wakayama Prefecture, and the city area was completely destroyed. More than 2000 houses are reported to have been burned out. However, the fires have not been fully investigated and the dynamics of the spreading fire is not known. In this study, the housing map with road map was restored to build the analytical model in the reported burnt area, using the aerial photograph before the event of the earthquake. Then, spreading fire analysis was performed by applying the Petri-net algorithm, using the map. The results of the analysis were verified based on the testimonies.

10. 出石伝統的建造物群保存地区における建築物の延焼脆弱性の定量化と二方向避難・放水範囲拡大のための対策提案

Verification of Fire Spread Risk in a Single Buildings, Proposal Fire Fighting and Two-way-refuge in Izushi Preservation District of Buildings

平尾和洋, 田邊勇樹, 大場修

In the former castle town of Izushi, Toyooka City, Hyogo Prefecture, the orderly layout of the town and the rows of traditional townhouses convey the remnants of the former castle town, and it was selected as an important traditional buildings preservation district of the country in 2007. However, it has been pointed out that the important traditional buildings preservation district has a higher need for disaster prevention measures than other areas. In this paper, we report the analysis of fire spread vulnerability focusing on a single building (Chapter 2), the policy for improving disaster prevention capability, and the verification result of effectiveness (Chapter 3).

11. 出石伝統的建造物群保存地区における町家の平面・意匠分析および延焼防止力向上を加味した修理修景基準改定への提案

Analysis of Characteristics in Machiya Houses in Izushi Preservation District for Groups of Historic Buildings, and the Proposal for the Design Guideline for Restoration Program with Improved Fire Spread Prevention Performance of Buildings

大場修, 平尾和洋, 中村魁

This paper reports the knowledge obtained from the literature and the exterior design survey of Machiya houses in Izushi important preservation districts of historic buildings, and the proposal for the design guideline for restoration program with improved fire spread prevention performance of buildings. Results are as follows: 1) The unique narrow frontage of Machiya houses is related to the plan configurations. 2) Various types of openings of Machiya houses have been preserved since the Meiji era. 3) Facade design of Machiya houses is associated with the plan configurations. 4) We propose the design guideline for restoration program with improved fire spread prevention performance of buildings.

12. 静岡県の指定文化財（建築）の災害危険性

Disaster Risk of Architectural Designated Cultural Property in Shizuoka Prefecture

山田耕司, 松浦穂乃果

It is necessary to know the disaster risk of architectural designated cultural property for the sustainability of historical cities. In this paper, the disaster risk of architectural designated cultural property in Shizuoka prefecture is discussed. The checked disasters are earthquakes, tsunami damage, liquefaction, flood and landslide disaster. The results are as follows. 1. The regions where the seismic intensity scale of JMA is over 6.0 are Hamamatsu city and Shizuoka city. 2. Two architectures have the risk of tsunami damage. 3. Seven architecture have the risk of flood. Almost of them are in Izu peninsula.

13. 特定電気事業による大規模停電への備えから考察する京都市のBCPに関する研究

Study on BCP in Kyoto City, Considering Preparations for Large-Scale Power Outages by Using a Specific Electric Power Business

福本真史, 本間睦朗

This journal focused on examining measures of blackout avoidance in the event of a power outage as part of the Kyoto City BCP. Kyoto is expected to have few emergency generators for its population. If a power outage occurs due to an earthquake in such a situation, it will be blackout and be in chaos. Therefore, in this research, supplying power to the target area using a generator shared in the area. In order to operate these as a business, we investigated and examined the scope of the target area and the generator to be used, the necessary cost, and so on. Finally, the business feasibility was examined by comparing it with the actual electricity bill.

14. 訪日中国人観光客の避難行動意思決定に関する研究

A Study on Evacuation Decision-Making of Chinese Tourists to Japan

楊曼尊, 豊田祐輔

This paper aimed to show the decision-making process of Chinese tourists to Japan for evacuation just after earthquakes. The number of inbound tourists had increased and it is expected to get more after the COVID-19 period, however, studies on evacuation decision-making by foreign tourists gained less attention. Based on this backdrop, the paper developed and verified a decision-making process model for evacuation behavior. Then it demonstrated several patterns which Chinese tourists are likely to take in decision-making processes.

15. 歴史地区における豪雨災害に備えた避難所機能のニーズ評価

—マーケティング手法を用いた整備項目の評価と提案—

Evaluation of Shelters' function Using Marketing Method and Proposal of Maintenance Policy -Preparing for a Heavy-Rain Disaster in Historic Districts -

大窪健之, 福永靖史, 金度源

In this study, authors conducted a questionnaire survey at “Kumakawa-juku” Important Preservation Districts for Groups of Traditional Buildings in Japan, which is expected to be damaged by heavy rain disaster in the future, and “Takehara” and “Unno-juku” which have been severely damaged in recent years. Using the results of questionnaire and conjoint analysis, which is one of the marketing methods, calculate the priority of functions that the residents evaluate as relatively important. The function of the current evacuation shelter in Kumakawa-juku was evaluated with reference to its importance. In response to the evaluation, a joint policy for the district was proposed to improve the function of evacuation centers and a policy in which residents developed the function of evacuation centers individually.

16. 2016年熊本地震における災害ボランティアの災害応急対策の時系列分析

A Time Series Analysis of the Emergency Response Measures by the Disaster Relief Volunteers in the 2016 Kumamoto Earthquake

留野僚也, 豊田祐輔, 鐘ヶ江秀彦

This paper provided time-series variation of disaster relief activities by disaster relief volunteers by using the meetings held for the purpose of relief coordination in the 2016 Kumamoto Earthquake by text-mining. It is found that most of the emergency response measures were similar to the trends in the occurrence of needs in past natural disasters. The majority of responses were related to “Emergency Telecommunications”, “Shelter”, and “Camp Coordination and Camp Management” in the two months since the disaster. Additionally, these areas were Cross-cutting/Common service areas, as there were relatively strong links between these areas, “Health” and “Early Recovery”.

17. ベイジアンネットワークを用いた路上犯罪発生箇所の特徴に関する研究

A Study on Spatial Features of Street Crime Outbreak Spot Using by Bayesian Network

山崎良祐, 宗本晋作

The purpose of this paper is to provide the method for the construction of the probabilistic model of the evaluation for the street crime outbreak spot. We applied Bayesian networks to construct graphical models that represented the correlation between the crime outbreak and multiple spatial elements which street environment was composed. Finally, a conclusion was made regarding the way to use the probabilistic model to predict and explain the street environment where street crimes occur most often.

18. 時空間的要因を考慮した NPO 法人の事業目的の分析に基づく文化遺産防災に関する考察
—都市縮小期を迎えた京都市を事例として—

A Study on Disaster Risk Management for Cultural Heritage Based on the Spatial-Temporal Investigation of Objectives of Non-Profit Organizations: A Case of Kyoto City in an Era of Urban Shrinkage

大橋弘明, 留野僚也, 豊田祐輔, 鐘ヶ江秀彦

In Kyoto City, the progress of urban shrinkage has been transforming the emergent process of non-profit organizations that are one of the key players in the local arena. This process has been differentiated across the city depending on local characteristics. This research thus explores spatial-temporal changes in objectives of non-profit organizations through text mining with a specific focus on the relationship between the two fields of disaster management and historic preservation. In conclusion, we point out that the activities of non-profit organizations for these two fields tend to divide spatially and are likely to deteriorate gradually alongside urban shrinkage, and then emphasize the importance of strategic policy interventions for creating wider and deeper networking among various actors in community, public, and private sectors, which can contribute to, or benefit from, disaster risk management for cultural heritage.

19. 災害の時間的フェーズを考慮した歴史都市防災に関する研究内容の傾向分析

An Analysis of the Research Activities on Disaster Mitigation of Cultural Heritage and Historical Cities Considering the Disaster Phase

小川圭一, 宇佐美智子

This study focuses classification of research activities on disaster mitigation of cultural heritage and historical cities, to know the current conditions of research activities and to consider the future activities on this field. Academic papers related with the research activities on disaster mitigation of cultural heritage and historical cities between 2019 and 2021 are classified from the viewpoints of types of cultural heritage, types of disasters, research fields and disaster phases. These results are compared with the results of classification of academic papers between 2007 and 2012 which are analyzed in existing research.

【報告】

1. Research on the Damage of Cultural Relics Buildings and Disaster Prevention Countermeasures in Heavy Rain in Henan, China

Pan Shu, Xiaofeng Zhang, Hongtao Liu

In July 2021, China's Henan Province suffered from extreme rainstorms, and cultural relics were damaged to varying degrees in the torrential rain disaster. A total of 563 cultural relics were affected. Among all the disaster-affected cultural relics, the cultural relics buildings were damaged in the largest number, with a total of 470. The report examines the damage mechanism and causes of the rainstorm disaster and cultural relics buildings through literature collection and field research, and examines the damage of typical cultural relics buildings. Suggestions on disaster prevention and mitigation methods for buildings.

2. Study on Rainstorm Damage and Countermeasures of Historical Villages in Shanxi Province, China --Taking Ding Village as an Example

Hengyu Wang, Xiaofeng Zhang, Hongtao Liu

In October 2021, Shanxi Province, China experienced the strongest precipitation process in

autumn since recorded, and some historical villages in Shanxi Province were seriously damaged in this rainstorm disaster. Through a large number of literature surveys, the author sorts out the disaster damage of historical villages in Shanxi Province. Taking Ding Village in Xiangfen County as the research object, the author expounds the damage and disaster response measures of the village in the rainstorm disaster, analyze the reasons behind the damages caused by disasters, and puts forward some countermeasures and suggestions for historical villages to deal with rainstorm disasters. It is hoped that the ideas in this report can provide reference for other historical villages to cope with rainstorm disasters.

3. 江戸時代後期と現代における周辺街路からの彦根城の可視性の定量的把握と比較分析 —歴史的景観保全と復興事前準備に向けた基礎的研究—

Quantitative Understanding and Comparative Analysis of the Visibility of Hikone Castle from the Surrounding Streets in the Late Edo Period and Modern Period: Basic Research for Historic Landscape Conservation and Reconstruction Preparations

藤井健史, 岩村晃志

The Japanese castle serves as a military and political base, and is now a regional landmark. Hikone Castle, the subject of research, is one of the 12 castles with the original castle tower. Hikone Castle and its castle town are protected as a heritage showing the accomplishment of modern castle politics, but no quantitative study has been conducted on the visibility of Hikone Castle from the surrounding streets. Therefore, in this study, we will grasp and compare the visibility of Hikone Castle in the late Edo period and modern period based on geometric calculations.

4. 火災情報を即時共有する地域防災情報ネットワークシステムの機能向上と評価に関する研究 —豊岡市出石伝建地区でのオンライン防災訓練を通して—

A Research about Improved Functionality and Evaluation of the System of Immediate Sharing Fire Information -Through a Online Disaster Prevention Drill in Izushi-

南本一樹, 大窪健之, 金度源

Izushi is a historic city. Because wooden buildings crowd, such an area is at increased risk for facing each other for a fire. For the security of inhabitants, people need quick initial fire extinguishing and refuge. In sharing information between inhabitants, they can refuge more safely and extinguish fire. Through an online disaster prevention drill and Conjoint analysis in Izushi, aim at checking of the system and extended functionality. Which information to display on the map could be founded.

5. Enlightenment of Fire Accident in Wengding Village of China to Fire Risk Management in Traditional Villages

Renhao Liu, Qian Zhang, Hongtao Li

Wengding Village, a historical village located in Yunnan Province, China, retains the folk customs and residential buildings of the Wa ethnic minority in China. It is a relatively complete original ecological Wa village so far. On the night of February 14, 2021, it was severely damaged by fire, and hundreds of traditional grass-wood dwellings were burned to ashes. Taking this case as an example, based on literature review, this paper analyzes and summarizes the damage mechanism, and discusses problems of existing fire emergency management and protection suggestions of this village, which aims to provide reference for fire emergency and prevention in similar ethnic villages.

6. まちなか commons 整備事業を活用した密集市街地の防災整備に関する研究

Research on Disaster Prevention Maintenance in Densely Populated Urban Areas Utilizing the Machinaka Commons Maintenance Project

廣山達哉, 大窪健之, 金度源

It is expected that a large-scale earthquake will occur in Japan in the future, and improving disaster prevention in densely populated urban areas is an urgent issue. In central Kyoto, where Kyomachiya and quaint narrow streets are concentrated, such as Kyoto City, it is necessary to improve disaster prevention in densely populated urban areas through

restoration-type town development. Therefore, in this research, we focused on the Machinaka Commons Development Project, which is a subsidy system of Kyoto City, which is considered as one of the effective methods for improving disaster prevention in densely populated urban areas and solving the problem of vacant houses. Clarified the issues.

7. 津山市重要伝統的建造物群保存地区における水害リスクに関する研究

Study on Flood Risk of Important Preservation Districts for Group of Traditional Buildings in Tsuyama

喜多孝輔, 酒井智弘, 岡井有佳, 馬場美智子

In Important Preservation Districts for Group of Traditional Buildings, measures against flood have not been fully implemented. Yoshi river running through the city area has occurred flooding frequently and brought damages in Tsuyama City of Okayama Prefecture. However, there are currently no adequate flood prevention measures in Important Preservation Districts for Groups of Traditional Buildings, where important traditional buildings are preserved. This study aims to identify the current risk of flood damage and its countermeasures in Tsuyama City, and to provide suggestions for future flood damage countermeasures in Important Preservation Districts for Groups of Traditional Buildings.

8. World Heritage Site · Pingyao Historical and Cultural City Flood Disaster Damage Research and Reflection

Qian Liu, Qian Zhang, Hongtao Liu

With the global warming, a large number of thermal energy formation typhoons caused by heavy rainfall frequently, located in the Asian region of Japan and China and other countries due to their geographical location and climatic factors, is a frequent area of heavy rain and flood disasters. In October 2021, the torrential rain in Shanxi Province broke through the record, and the ancient city of Pingyao became one of the most severely damaged areas in the flood disaster. Taking this as an example, this paper analyzes and studies the disaster mechanism of the ancient city through literature collection and other means, and examines the existing rescue and protection measures of the ancient city, and finally discusses and makes suggestions for the problems existing in the protection of the ancient city of Pingyao. It aims to provide reference for disaster prevention and mitigation methods for cultural heritage of historical and cultural cities under the influence of flood disasters.

9. Earthquake Hazard Preparedness Index (EHPI) Mapping a Solution to Tackle Earthquake Disasters

Afroz Ahmad Shah, Navakanesh M Batmanathan, Joy Jacqueline Pereira

Billions of people inhabit Asian countries, and millions live on active faults. Most earthquake hazards are related to megathrust faults, which have caused some of the most devastating earthquake disasters in human history. No one would like a repetition of the devastation caused by the 2004 Indian-Ocean earthquake and tsunami and similar other events. The vulnerability of life to earthquakes and associated hazards will continue, and prediction remains impossible with the current scientific wisdom on the science of faulting, which has been accumulated after more than two centuries of hard work. Therefore, the challenge that hovers on our responsibilities is the possibility of large earthquakes on megathrust faults, which could prove devastating. And this challenge has not been fully explored in the past; here, we try to rekindle this critical conversation by showing the vulnerability of megathrust faults in Asia and how future earthquakes can significantly damage the highly populated and urbanized sections including the UNESCO Heritage sites. We propose the introduction of country-specific Earthquake Hazard Preparedness Index (EHPI) maps, which will rank a country's preparedness to handle earthquakes and associated hazards. The EHPI mapping will be combined with the existing earthquake hazards maps to rate the overall efficiency of dealing with earthquake hazards. The need arises from the fact that although we have spent more than two centuries understanding the science of earthquakes, we faced enormous defeat in the Sumatra-Andaman Earthquake of 2004, the Kashmir Earthquake of 2005, and other similar earthquakes events elsewhere. The devastating was not unexpected, but we

had no mechanism to check the preparedness of a particular nation for such hazards. That changed the entire outlook on dealing with earthquake hazards and how to stop them from turning into monsters.

10. 歴史的な地区の防災活動状況や住民の防災意識に関する研究
—奈良県五條市五條新町重伝建地区を対象として—

A Survey on Disaster Prevention Activities in Historic Districts and Residents' Awareness in Gojo Shinmachi Town

金度源, 倉本紗季, 大窪健之

“The Preservation Districts for Important Traditional Buildings” have been selected to conserve their historical and cultural value. At the same time, it is difficult to strengthen the disaster prevention system structurally, so it is important and urgent to take measures in a nonstructural way. In this study, interview surveys and questionnaire surveys were conducted targeting the Preservation District of important traditional buildings in Gojo Shimmachi town in Nara Prefecture. The district's disaster prevention activities and the residents' disaster prevention awareness were analyzed to plan the next nonstructural practices implemented through the surveys.

11. ネパールにおける伝統的施設および教育施設の防災拠点としての活用可能性
—ゴルカ地震を経験したパタン地区での実例を対象として—

Research on Possibility of Utilizing Traditional Facilities and School Facilities as a Disaster Base in Nepal -In case of Patan WH Site that Experienced the Gorkha Earthquake-

里中涼華, 大窪健之, サキヤラタ, 金度源

On April 25, 2015, the Gorkha earthquake occurred in Nepal and hit Patan district designated as World Cultural Heritage. The evacuation life was run mainly by the local community (Tole), but it was found that there was an environmental issue with the courtyard of the outdoor space as an evacuation center. Therefore, in this study, the interview survey was conducted by referring the school facilities used as disaster prevention bases in Japan, and clarified the possibility that the school facilities and community houses, which are the internal space, can be used as disaster prevention bases.

12. 文化財防災研究や歴史災害研究への発掘調査データベースの活用

Utilization of Excavation Database for Cultural Property Disaster Prevention Research and Historical Disaster Research

武内樹治, 矢野桂司

The purpose of this paper is to illustrate the potential use of archaeological sites and excavation databases for cultural property disaster prevention research and historical disaster research. By overlaying information on archaeological sites and hazard maps as a Web GIS, it is useful to plan for future protection and utilization of archaeological sites in consideration of disasters, and by making the results of excavation surveys available on a map, it is easier to link them to historical documents and results of historical disasters with geographical information. In particular, the possibility of approaching historical disaster research through the superimposition of maps by GIS was demonstrated.