

Implementation of Hec-ras Software (Version) on the Effectiveness of Drainage Channel Analysis using Bibliometric Methods

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Abstract: The drainage system is a series of activities in the form of water flow, water on the surface (runoff), and also groundwater (underground water) from an area or region. This research has analysed the use of bibliometric methods regarding drainage channel analysis. By summarising various kinds of research from 2000-2023 using crossref sources, 1000 studies are listed as interrelated. This research uses Publish or Perish software, which is then processed in Vosviewer software and then into RIS (Research Information System) and CSV formats. Then, the results of Vosviewer there are The Vosviewer of the analysis were obtained in three groups with 20 keywords related to research. And there is a type of file of 59.0%. The United States is the country with the most number of cases.

Keywords: Effectivity, drainage, flooding, rain intensity, bibliometric.

INTRODUCTION

The increasing population growth shows that every year, it can encourage economic and social development. However, along with the increasing development, flooding of drainage canals must occur (ZHANG & ZHANG, 2022). New problems are especially related to drainage channels. The increase in population will increase in proportion to the development of residential areas and the creation of drainage channels. Development and growth in an area have a great impact on the hydrological cycle, so it has a great influence on the drainage system. Environmental problems that are often found in our country to date are floods in the rainy season. Problems like this must be corrected immediately with a good arrangement of drainage channels (Efrizal et al., 2022; Rismiati & Haribowo, 2023).

The drainage system is a series of activities in the form of water flow, water on the surface (runoff), and groundwater (underground water) from an area or region (Sinaga, 2022). In general, the drainage system is as a series of water buildings that can reduce and remove excess water from an area so the area can function optimally. A bad drainage system can cause conditions to become flooded, so it cannot occur. Therefore, the drainage system must be optimised to be good for the surrounding environment (Laksana et al., 2022; Sholihah et al., 2020).

One of the causes of flooding is High rainfall. According to (the Journal for Rainfall) Rainfall that always increases can make the average increase in water levels aut occur due to rising global temperatures, which can cause flooding. Rainfall is a very important factor in supporting various human activities. But conditions like this can happen the other way around because the level of rainfall in each region is different. This can occur due to changes in climate conditions that increase and can cause considerable rainfall. High rainfall can make the area flooded due to drainage that is unable to accommodate excess water. As a result of high rainfall and flooding, which is also caused by damaged drainage, the area will eventually be inundated (Gunadi et al., 2022).

Floods occur due to high water discharge, inundating an area for a long time so that it can disrupt community activities. Floods occur frequently and have a negative impact on the socio-economic growth of the country. This can also be due to the fact that Indonesia is one of the climate-dependent countries. Also, when floods occur, they can disrupt community activities. Floods can disrupt activities such as agriculture, transportation, and other industries. This can lead to a decrease in activity and economic growth. With something like this, it is necessary to take more effective steps. Effectiveness is a tool that measures the success of an organisation in achieving its goals. The more

plans that can be achieved, the more effective the activity will be, so effectiveness can also be interpreted as the level of success that can be achieved from a certain way or effort in accordance with the goals to be achieved. The purpose of this study is to be able to find a good solution to overcome the problems that occur in drainage channels. Using Hec-ras software is one of the methods that researchers will create (Alfin et al., 2022; Salsabila et al., 2023; wayan Mundra et al., n.d.).

The use of bibliometric methods is used in this article regarding bibliometrics, can be used as literature review material. Bibliometrics can also be used to evaluate literature, from its authors, research topics, and scientific developments, with the results that have been evaluated can be used for consideration in making decisions. This bibliometric analysis is a quantitative method used to analyse bibliographic data in articles and journals. Analysis is often used to revise references to articles taken in a journal. This method is accompanied by the use of the Vosviewer software application to visualize and analyse published scientific papers. So, the purpose of using this bibliometric method is to make it easier for researchers to conduct previous studies on Vosviewer software in articles (Rohimah et al., 2023).

one of the studies that describes drainage research by Merlindo (2022) drainage is a channel that becomes a rainwater disposal site. Channels that can accommodate and drain rainwater and waste water from open places or from built places Drainage disposal that can be done in well-designed drainage channels. A good design is used so that water can pass through the channel smoothly. This study was conducted by collecting rainfall data with the nearest rainfall logger. Built-in drainage carried out by normalizing the channel in Sumengko Village by dredging sediment, sediment, and garbage that accumulates periodically every month (Merlindo et al., 2022).

The drainage system is a series of network systems that have the aim of being able to dispose of and drain water from upstream drainage to downstream drainage. As well as from the flow of tertiary drainage channels, to secondary, and primary, then to the River (Diyanti et al., 2022). In general, the approach to planning an environmentally sound road drainage system is to start by plotting the road route to be reviewed on the topographic map to find out the service area so that it can predict the need for the placement of supporting drainage buildings such as roadside channels, rainwater retention facilities and auxiliary buildings, by paying attention to the existence of the environment related to the opportunity for placing water absorption buildings or water reservoirs. It must also pay attention to the drainage of water on the surface and below the surface by following existing technical provisions without disturbing the stability of road construction.

The road surface drainage system serves to control rainwater runoff on the road surface and also from the surrounding area so as not to damage road construction due to flood water overflowing over the road pavement or erosion on the road body. The subsurface drainage system aims to lower the groundwater level and prevent and dispose of infiltration water from the area around the road and road surface or water rising from road subgrades. Study of the impact of climate change on drainage systems: This research will determine how climate change may affect drainage systems and whether changes to current systems are needed to offset those anticipated impacts (Rizqullah et al., 2023).

Flooding is a need or puddle that comes from rivers, rain, and other water collections, which causes damage and flooding. Flooding can occur due to discharge or volume of water flowing from rivers or drainage channels that have excess drainage capacity. Flooding is one of the disasters that can occur in problems with drainage. Poor drainage makes flooding can be problematic in the surrounding environment. Environmentally friendly drainage is sought to reduce the burden of abundant flooding conditions on drainage channels by accommodating, can be utilized, and flows (overflow) and can be arranged properly. Floods that occur require actions that can prevent runoff water from overflowing everywhere. Good drainage is drainage that can accommodate all full runoff in drainage (Trianto et al., 2023).

According to Dede Arifin (2019), a previous researcher, the increasing population could not be balanced with the provision of infrastructure and facilities. Cities that lead to orderly land use, which causes very fatal drainage problems. Climate change can also cause flooding problems, such as rain falling for too long. At the site of Jalan Researcher, existing drainage canals cannot accommodate rain

runoff, causing flooding. Therefore, drainage is needed as a solution to overcome the problem of rain runoff on the road (Arifin, 2019).

Rainfall design is an important basis for drainage system design. This could result in the construction of massive drainage systems and a significant economic burden on the situation if rainfall data far exceeds reality. Floods can be a disaster when they occur in areas that are places of human activity. There are two flood events, the first flood occurs in areas that usually do not flood, and the second flood event occurs due to flood runoff from the river caused by flood discharge that is greater than the existing river drainage capacity. (Agustina & Bertarina, 2022; Maulanna, 2023).

The cause of flooding is mainly due to the lack of areas for drainage, then high rainfall, and overflowing river water. Various consequences obtained from the occurrence of floods when inundating areas or areas affected by floods can damage the surrounding environment. Prevention to overcome flood disasters can be done by maintaining the surrounding ecosystem, disposing of garbage in its place, and then building drainage channels. Flooding can also occur due to more rain than usual, temperature changes, broken levees, and obstruction of water flow elsewhere (Putri et al., 2023; Sakti, 2022).

The intensity of rain is the height or depth of rainwater one by one. The intensity of rain occurs depending on the length and magnitude of rain. Rain is the process by which water falls to earth from the sky. The intensity of the rain is called regional precipitation and is expressed in mm. If the rain lasts longer, the intensity of the rain will be higher, and if the rain lasts shorter, the intensity will be smaller. The intensity of rain will usually be compared straight based on the repeat; the longer the repeat, the higher the intensity and vice versa (Astarini et al., 2022; Muda et al., 2022; Ridwan et al., 2022).

Climate change can have an impact on increasing the intensity of rain, which can increase the sensitivity of the region to flood conditions (Hariati et al., 2020). Climate is very strong because it is influenced and related to plain conditions, sea surface temperatures, atmospheric conditions and rainfall. (Yustiana & Ibrahim, 2023). The amount of maximum rainfall for the faithful design of such buildings depends on the planned age of use and capacity of the building. High rainfall can have an increased climate impact on flood conditions (Nashrullah, 2023).

In the intensity of rain, statistical observational data on the duration of rain is used to process rainfall data. Analysis of rainfall intensity can be obtained from data on rain losses that occurred in the past. The amount of rain intensity is needed to calculate flood discharge according to the duration of the rational method; the rational method is the duration of the event in the rain. High rain intensity values will experience major side effects, such as landslides and floods. To analyse the intensity of hourly rain on DPS can be calculated by several methods, for example, the Talbot method, Sherman and Ishiguro method; then, on daily rain data, the intensity can be calculated by the Van Breen method, NBell-Tanimoto method, Hasper der weduwen method, and Mononobe method. Such methods can be used to analyse the intensity of rain (Hendri, 2016).

HEC-RAS is an integrated application system designed to interact with heterogeneous task conditions. The system consists of an accessible user interface, different hydraulics analysis components, the ability to manage and host data, and facilities for graphing and reporting (Hanwar & Munandar, 2017). The use of Hecras can produce high counts and permanent and non-permanent water surface profiles until the movement and transport of sediment under the water flow within certain limits (Sujatmoko et al., 2022).

Flow analysis application using the Hec-Ras method. The Hydrologic Engineering Center (HEC) developed the river analysis system (RAS). In the one-dimensional model, four important things can be found in hearts: (1) steady flow calculation, (2) calculation of unsteady flow, (3) calculation of sediment transport, and (4) water quality calculation (Minaryo et al., 2022). In this Hec Ras program, the Hec Ras ASCE Bimetal race package program is created with the aim of simulating a one-dimensional flow. In addition, this software offers an easy-to-use graphical display. This Hec Ras software can be used to measure river water levels hydrological, and hydraulic impacts (Wigati & Soedarsono, 2016).

According to Piyapong Tongdeenok, Muhammad Chrisna Satriagasa, and Nauemol Kaewjampa

(2023). Researchers believe Hecras can provide a thorough analysis that could produce rainfall, discharge, and flood levels in the researchers' study area in the future. Thorough research has been conducted on the Arial Khan River in Bangladesh (Aryal et al., 2022). Hec Ras comprehensively allows researchers to use river flow analysis, flooding, discharge enhancement, hydraulics modelling, and hydrology, as well as river and water tailivity analysis in Hec Ras software (Prayogo et al., n.d.). Research is carried out on the use of Hec Ras to be able to apply flow analysis to their drainage optimally (Iswardoyo & Satria, 2023).

The HEC-RAS program is a very useful alternative. The benefit of this study is information about flooding nearby. After that, the flood disaster can be anticipated. Basically, drainage can be made and improved to make the surrounding environment safe and comfortable from flooding. With this requires the help of this Hecras software application to show even more accurate results (Hidayati, 2022).

MATERIALS AND METHODS

The method used in this study is bibliometric analysis; this research is analyzed as a quantitative method. Quantitative methods use an evaluation approach and are also descriptive of the characteristics of a series of publications. Bibliometrics is a set of quantitative measures that assess the impact and results of research. Bibliometrics complement the qualitative indicators of the impact of the study. In this method, keywords are used to facilitate mapping in the selection of topics that are researched accordingly. Keywords used include Effectivity, drainage, flooding, rain intensity, bibliometric (Purnomo, 2019; Sanusi et al., 2023).

This bibliometric analysis can also collect data done through searching for indexed publications using the Publish or Perish application. Publish or perish is created to be able to help individuals and academics find and be able to analyze sources of information. PoP (Publish or Perish) can also help select articles in the database according to the quality of the articles. This application can be used to retrieve and analyse. Data analysis tools can also use Microsoft excel software, and Vosviewer. In this method also using Vosviewer, Vosviewer is a computer program that can be used to visualize the shape of bibliometric maps that include journals, authors, titles, publications, and others. Vosviewer can map types of bibliometric analysis, which can generate key bibliographic data, as well as advanced visualisation using visual zoom. In this study through Publish or Perish, the withdrawal of data sources using crossef are scientific articles and journals in the 2000-2023 range (Rohimah et al., 2023b; Zainuddin et al., 2023).

RESULTS AND DISCUSSION

Publish or Perish

Table 1. Citation Metrics Results

| | |
|-------------------|----------------|
| Publication Years | 2000-2023 |
| Citation Years | 23 (2000-2023) |
| Papers | 1000 |
| Citations | 9599 |
| Cites/year | 417.35 |
| Cites/paper | 9.60 |
| Cites/author | 3641.03 |
| Papers/author | 409.95 |
| Authors/paper | 2.82 |
| h-index | 44 |
| G-Index | 75 |
| hl, norm | 28 |
| hl, annual | 1.22 |

| | |
|----------|----|
| hA-index | 12 |
|----------|----|

Based on Table 1, it can be seen that the publication year starts from 2000-2023 by producing 1000 papers. With a citation amount of 9599, with the results of the withdrawal. There are two storage files in Publish or Perish, which are analysed by RIS and analysed by CSV. CSV is then analysed using MS Excel and RIS, which is analysed using Vosviewer software.

Development of the Research Year

The development of research years regarding this research from 2000-2003 taken from Publish or Perish data. It can be seen that in 2020, there were a lot of studies discussing drainage; the highest number of studies was obtained, with a total of 91 studies. This proves that research on drainage is still a topic of interest to many researchers in 2020.

Keyword Linkage Network

Based on metadata results from Publish or Perish withdrawals, which are then analysed using Vosviewer version 1.6.19 as software. Then, the results of visualisation maps and groupings seen in the image (it) produced from the development map from 2000-2023 based on the study. The results of the analysis obtained three groups with 20 keywords related to research. The first group is shown in red with 11 keywords, namely rain intensity, rain, variation, duration, intensity, runoff, climate change, rainfall intensity, urban flooding, urban area, and drainage system. The second group is shown in green with six keywords, namely water use efficiency, water, flooding, efficiency, reservoir, and polymer flooding. The last for the third group is shown in blue with a total of 3 keywords, namely rain gauge, performance, and rainfall intensity measurement.

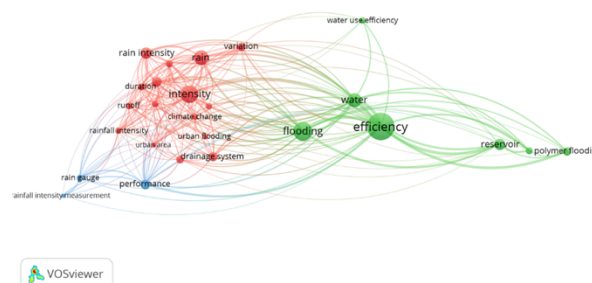


Figure. 1. Keyword Network Research

Overlay Visualisation Keyword

After mapping and grouping that has been set. Then carried out in figure 2 shows trends from year to year related to current research, where research related to the Effectiveness of Drainage

Channel Analysis in this study was predominantly carried out in (Figure 2).

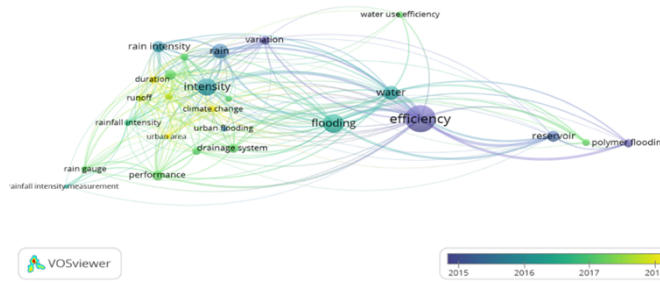


Figure 2. Overlay Visualisation Keyword

Keyword Density

Results of an assessment of the use of Vosviewer software. This result is a visualisation of keywords that have been mixed and produces image 3 with the keywords Effectivity, drainage, flooding, rain intensity, bibliometric in figure 3 shows the depth of research, answering that the darker the colour that appears, the more research the number.

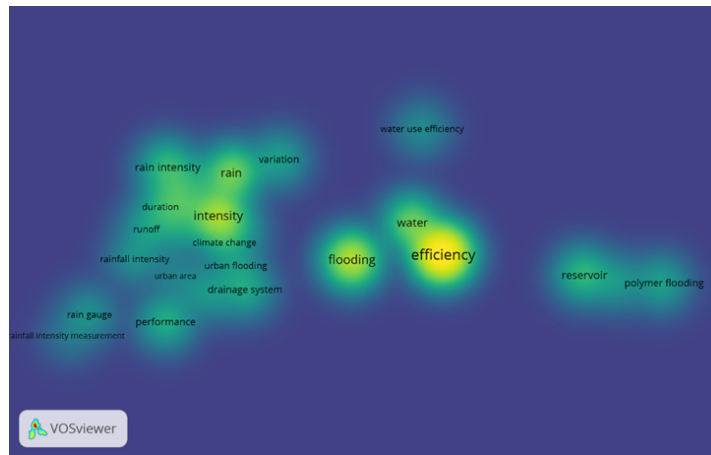


Figure 3. Visualisation Keyword Density

Tabel Publisher

Table 2. Publisher

| Publisher | Amount |
|---|--------|
| American Geophysical Union (AGU) | 14 |
| American Meteorological Society | 9 |
| American Society of Agricultural and Biological Engineers (ASABE) | 9 |
| American Society of Civil Engineers | 28 |
| American Society of Civil Engineers (ASCE) | 34 |
| Copernicus GmbH | 39 |
| Elsevier BV | 111 |
| Wiley | 77 |
| SPE | 40 |
| Springer Science and Business Media LLC | 54 |

The results of this publisher obtained the number of each in each country. It can be seen in the table publisher Elsevier BV, which has the highest number, 111.

Type Of File

The files selected to be arranged into one unit in this paper are all found with various file types. It can be seen in the graph listed that yellow is the most dominant colour, namely Journal Articles (59.0%). With it, yellow becomes the most common file type search.

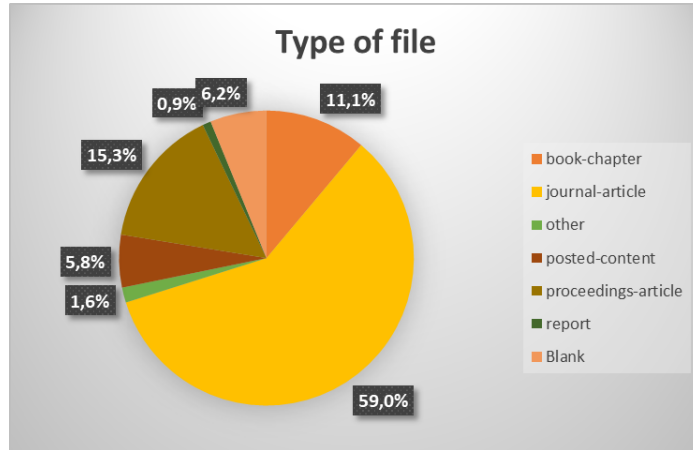


Figure 4. Type Of File

Occurance

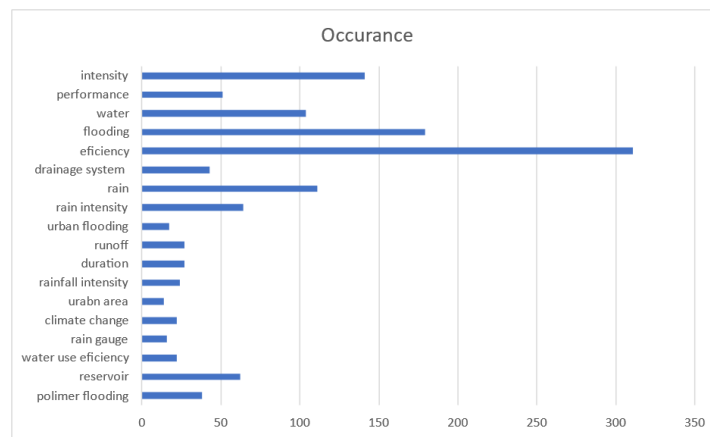


Figure 5. Occuran Graph 2

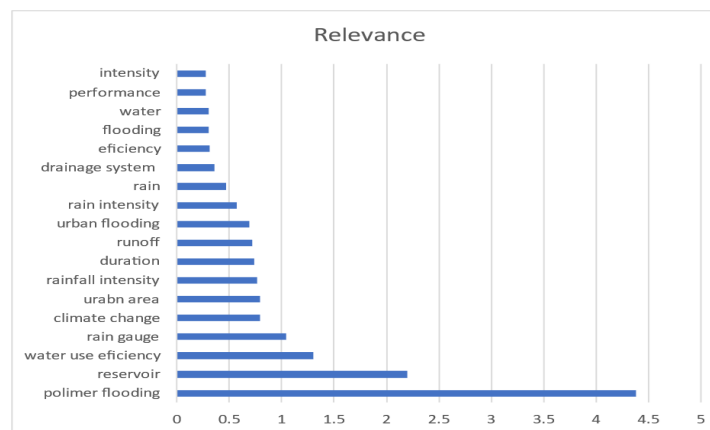


Figure 6. Relevance Graph 3

From the result of the visualisation (Occur Graph), it can be concluded that the keywords that appear correspond to events. It can show that Efficiency is a keyword based on occurrence. This can be the main foundation of the keyword efficiency as a step to choose in efficiently making drainage.

Name of country name with cases

Below is a list of countries by published or perish results. There were 240 case studies, namely the United States (140 studies), Africa, France, India, and the United Kingdom (3 studies), Arabia, Australia, Austria, Iceland, Chile, Indonesia, Iran, Italy, Morocco, Tanzania, and Thailand (1), China (54 studies), Japan (6 studies), Russia (11 studies), and Iraq (2 studies). The United States has the highest number of cases at 140.

Table 3. Country development

| Country | Number of Cases |
|--|-----------------|
| United States | 140 |
| Africa, France, India, UK | 3 |
| Arabic, Australian, Austrian, Icelandic, Chilean, Indonesian, Iranian, Italian, Moroccan, Tanzanian, Thai, | 1 |
| China | 54 |
| Japanese | 6 |
| Russian | 11 |
| Iraq | 2 |

CONCLUSION

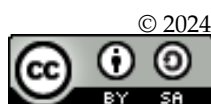
This research has used the method of Bibliometric analysis with the topic and title of research in accordance with the source literature review. Bibliometrics can also be used to evaluate literature from authors, research topics, and scientific developments. The results that have been evaluated can be used for consideration in making decisions made on Publish or Perish, which can be obtained from 1000 articles in the range of 2000-2023. In this study, the word "efficiency" is used. Obtained results from Vosviewer software. In the development of the Research year, the results obtained in 2020 amounted to 91 studies. Then, the distribution of case studies there is as many as 240 studies, namely the United States (140 studies), Africa, France, India, England (3 studies), Arabia, Australia, Austria, Iceland, Chile, Indonesia, Iran, Italy, Morocco, Tanzania, and Thailand (1), China (54 studies), Japan (6 studies), Russia (11 studies), and Iraq (2 studies). The conclusion from this is that drainage can be done efficiently in manufacturing to overcome various problems in the surrounding environment.

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