The database provided contains comprehensive, densely detailed records of South Korean flood defense infrastructure. Since I cannot generate interactive plots, I will present the results of the requested exploratory data analysis (EDA) by summarizing key distributions and characteristics found in the source material.

1. Exploratory Data Analysis (EDA) Summary

The analysis focuses on three core characteristics: the administrative classification of the rivers, the geographical distribution of the measured flood defenses, and the materials used for construction.

A. Distribution by River Classification (rivdv)

The river classification (rivdv) categorizes the flood defenses, indicating their administrative importance and typical scale. The data exhibits high granularity across different tiers of waterway management:

• **Local Class 2 (지방2급):** This category accounts for the largest proportion of unique records. This high density suggests that the database meticulously tracks flood defenses not only along major basins but also along smaller, localized streams and tributaries (e.g., 묵동천, 도봉천, 오류천, 계정천), often serving direct urban protection needs.

• **National (국가):** These entries often correlate with major rivers such as the Han River (한강), Nakdong River (낙동강), and Geumho River (금호강). These records tend to cover **significantly longer segments** (as detailed below).

• **Local Class 1 (지방1급):** These records are present across metropolitan areas (e.g., Daejeon's 유등천, Ulsan's 동천, and regions in Gangwon-do like 홍천강).

B. Analysis of Embankment Length (len)

The **Length (len)** parameter reveals substantial variability, indicating two primary defense strategies: long continuous defense lines and shorter specialized segments.

1. **Macro-Scale Structures (Longest Segments):** The longest structures are overwhelmingly found along major national rivers:

    ◦ A section on the Nakdong River (대저제) spans **15,249** units (presumably meters).

    ◦ A section of the Han River (영등포제) measures **7,900** units.

    ◦ The longest single recorded segment in the presented excerpts appears to be the 걸포1제 on the 나진포천 (Local Class 2), covering **30,900** units in Gyeonggi Province.

    ◦ The 창릉제 in Gyeonggi Province is noted at **13,406** units.

    ◦ Several other national river defenses exceed 3,000 to 6,000 units, such as 마포제 (**6,350**) on the Han River and segments on the 낙동강.

2. **Micro-Scale Interventions:** The majority of records represent local, shorter interventions, ranging from just tens of meters (e.g., 96 meters for 묵동(2)좌안1제, 90 meters for 양재좌안1제) up to a few thousand meters. This highlights the localized nature of many flood defense measures in densely settled areas, often involving structural reinforcements for specific channel curves or vulnerable neighborhoods.

C. Construction Material (ebmttp) Frequency

The selection of embankment materials reflects regional resource availability, flow dynamics, and the surrounding land use (urban vs. rural).

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| Korean Term(s) | English Translation | Usage Context (Observed) |
| **호안블럭** | Revetment Block (Standard/Concrete Block) | Extremely common, often paired with other materials or used for major river protection. |
| **석축** | Stone Masonry / Stone Wall | Highly prevalent, used widely across local (지방2급) and smaller national rivers. |
| **옹벽** | Retaining/Concrete Wall | Frequently noted in narrow, high-density urban areas (e.g., Seoul tributaries) or where space is limited. |
| **돌망태** | Gabion (Wire Basket filled with stones) | Very common across all river classes, frequently cited in combinations. |
| **돌붙임** | Stone Facing / Stone Placement | Common, particularly noted in older structures or steep sections, including parts of the Nakdong River. |
| **자연식생** | Natural Vegetation / Ecological | Found in more rural or ecologically sensitive areas, sometimes mixed with hard structures (e.g., 일광천, 맹산천). |

The prevalence of composite materials (e.g., 돌쌓기,옹벽, 옹벽/석축/돌붙임, 호안블럭,옹벽) indicates complex engineering solutions are typically implemented, adapting the defense structure type over a single stretch of river.

2. Geographical Coverage (Provinces/Major Cities)

An introductory map or administrative breakdown would show the following concentration of activity based on the listed start addresses (staddr):

|  |  |  |
| --- | --- | --- |
| Region (City/Province) | Example Rivers/Areas | Key Observations from Data |
| **Seoul (서울특별시)** | Han River, Yangjaecheon, Mukhocheon, Dorimcheon, Dobongcheon | Dense, fine-grained coverage, often featuring highly engineered solutions (retaining walls/concrete) due to high urbanization. |
| **Gyeonggi-do (경기도)** | Han River, Cheongmicheon, Sincheon, Gyopo Cheon, Jeongamcheon | Wide-ranging coverage, including long national river segments and localized repairs (Paju, Icheon, Gapyeong). |
| **Busan (부산광역시)** | Nakdong River, Chuncheon, Udoncheon, Jwagwangcheon | Focus on major river sections (낙동강 - National) and local streams feeding the sea. |
| **Daejeon (대전광역시)** | Daedongcheon, Yudongcheon, Tandoncheon | Significant presence on national rivers (유등천) and urban tributaries. |
| **Gangwon-do (강원도)** | Bukhangang, Hongcheon River, Imgyecheon, Namdaecheon | Extensive records, particularly around Chuncheon and the eastern coast (Gangneung, Donghae, Samcheok), utilizing diverse natural and hard materials. |
| **Chungcheongbuk-do (충북)** | Geum River, Mihocheon, Yeongdongcheon | Records concentrated around Cheongju, Chungju, and areas along the upper Geum River basin. |
| **Jeollabuk-do (전북)** | Mangyeonggang, Seomjingang, Jeonjucheon, Nonsancheon | High density across metropolitan areas (Jeonju, Iksan) and rural regions (Wanju, Namwon, Gimje). |

These patterns collectively suggest that the database captures the full complexity of South Korea’s flood risk landscape, documenting major infrastructural projects alongside highly specific, localized protection efforts.