論文

Evaluation of Scenery from the Window of Local Railways

Focusing on Hapi-Line Fukui

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This study evaluates the landscape visible from the windows of the Hapi Line Fukui, which opened in the spring of 2024, to explore its visual qualities. The railway features diverse landscapes, including natural and urban land uses. Using the Weighted Sum Model (WSM), the study assesses the combination of natural landscapes and artificial structures seen from the train windows. Landscape data along the route is collected to calculate the scenic value of each section (between stations) and to develop a new indicator for assessing the visual characteristics of train window landscapes. The analysis reveals different landscape characteristics for each section. The segment from Ushinoya Station to Harue Station is highly rated for its natural beauty, while the section from Harue Station to Echizen Hanando Station scores lower due to urban influences. High levels of natural scenery are observed from Echizen Hanando Station to Sabae Station and from Takefu Station to Yunoo Station. However, the section from Sabae Station to Takefu Station scores lower due to the urban environment, and the final section to Tsuruga Station, with many tunnels, also receives a low landscape evaluation.

***Key Words**:* Local railway, Landscape evaluation, Railway window scenery, Landscape elements

1.Introduction

Railway journeys provide an opportunity for passengers to appreciate and engage with the landscapes they traverse, transforming travel from mere transit to an enriching exploration of the environment. The dynamic panoramas offered by train travel allow passengers to experience a continuously evolving tapestry of natural and human-made scenes. This aspect is particularly significant for the local communities in Fukui Prefecture, Japan, where the local rail lines wind through a diverse mix of rural settings and urban centers. For the residents of Fukui, these rail journeys are not only a mode of transportation but also a means to connect with and appreciate the unique geographical and cultural landscapes of their region. The diversity of these visual experiences makes Fukui an ideal case study for investigating how landscapes are perceived through the medium of rail travel, particularly from the perspective of the local inhabitants.

Previous studies have explored various aspects of landscape perception through train windows. One study focused on window views and the perception of scenery in local railways, particularly the Echizen Railway, providing valuable insights into how passengers interact with and perceive the passing landscapes(1). Another study visualized railway window landscapes in local cities, contributing to the understanding of how urban and rural scenes are experienced through train travel(2). Research on landscape generation through train windows has further enhanced the body of knowledge on this topic, shedding light on the processes and factors influencing landscape perception from a moving train(3). Studies have also

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investigated the characteristics of scenery from suburban train windows, examining how different environmental features are perceived and valued by passengers[4]. Evaluations of landscape preferences by citizens in Matsudo City have added to the understanding of how local populations interact with and appreciate their surrounding environments, providing a community-based perspective on landscape aesthetics[5]. These diverse studies collectively contribute to a comprehensive understanding of landscape perception in the context of railway travel, highlighting the dynamic interaction between passengers and the visual environments they traverse.

The primary objective of this study is to evaluate the impact of visual landscapes observed from train windows on the experiences and perceptions of passengers traveling through Fukui Prefecture. Fukui boasts a rich tapestry of natural scenery, encompassing mountains, coastlines, and agricultural fields, along with a mix of historical and contemporary urban centers. This confluence of diverse geographical and cultural elements offers a comprehensive view of the region's identity. This study seeks to analyze how the aesthetics of these landscapes are perceived and appreciated during daily commutes and leisurely travels, providing an optimal setting for such an inquiry[2].

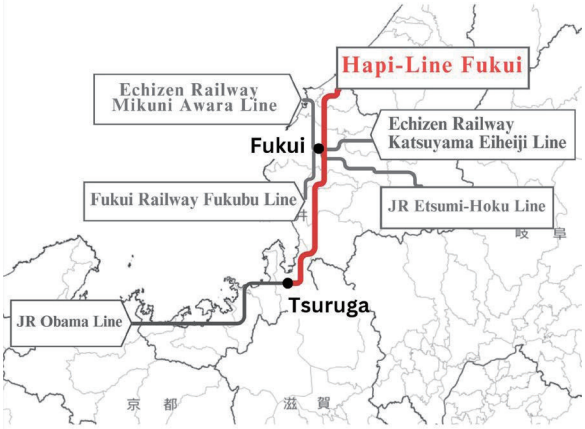

Fig.1 Railway Map in Fukui

This study builds upon prior studies that have highlighted the importance of landscape views in augmenting the quality of railway travel. For instance, previous work has analyzed the characteristics and effects of landscapes visible from train windows, demonstrating their vital influence on travel satisfaction and preference. Additionally, recent investigations into public preferences for urban landscapes have emphasized their significant role in enhancing regional appeal and tourism development[4]. Furthermore, recent studies have explored the generation of landscape views through train windows, providing insights into the processes and factors influencing landscape perception from a moving train[3]. This study centers on the Hapi-Line Fukui, exploring its role in enhancing passenger experiences through scenic engagements. By integrating the aesthetic value of the landscape, which refers to the perception of beauty and visual pleasure derived from natural and human-made environments, this railway not only bolsters provincial tourism but also enriches the overall journey for travelers. This aesthetic value encompasses elements such as the harmonious arrangement of natural features, the presence of culturally significant landmarks, and the overall visual coherence of the scenery. This analysis aims to provide a broader understanding of how landscapes can augment transportation services and contribute to regional appeal[5]. Hapi-Line Fukui, a new railway company, will take over the management of the parallel conventional line (currently the Hokuriku Main Line between Tsuruga and Ushinoya stations) from JR West Japan following the opening of the Hokuriku Shinkansen in Fukui. This transition aims to make Hapi-Line Fukui a beloved local railway, increasing convenience, focusing on community development around stations, and integrating with other local transportation. These efforts also seek to establish a more community-oriented rail service.

2.Objective

This study is dedicated to meticulously collecting and analyzing the variety of landscape vistas observable from train windows as trains navigate local railway lines and make stops at various stations. It investigates the assorted terrains

encountered along each route, focusing on quantifying the aesthetic value of these landscapes. Furthermore, the study compares scenic scores across different railway lines to determine the effectiveness of each route in providing visually engaging experiences. It emphasizes local scenic values, enhancing the appeal of local railways as gateways to discovering regional natural and cultural treasures. This study not only aims to enrich the narrative of travel experiences on local trains by offering passengers a preview of the scenic views but also promotes railway travel to foster regional exploration and appreciation by both locals and tourists. It underscores the role of scenic views in enhancing travel experiences and supports sustainable tourism initiatives, laying the foundation for future efforts to preserve the region's natural and cultural heritage through immersive scenic railway journeys.

3.Method

To gather data, this study employs aerial photography to accurately measure the proximity of various landscape types visible from the train, providing comprehensive data on the landscapes observable from both sides of the train windows. For analysis purposes, these landscapes are segmented into two primary categories: middle ground and background. The middle ground typically comprises elements just beyond the immediate trackside but within a closer range, such as nearby fields, small buildings, and lower vegetation. The background includes distant features that often constitute the panoramic backdrop of the journey, like mountain ranges, large forests, and expansive bodies of water. Foreground elements, which pass quickly and are challenging to observe at train speeds, are not analyzed. This exclusion is due to the practical limitations of observation imposed by the speed of the train, which prevents detailed observation of proximate objects.

The analytical approach utilizes the Weighted Sum Model (WSM), a simple yet effective method in multi-criteria decision-making. This model involves assigning weights to various criteria based on their importance and summing them to derive a total score for each option, facilitating comparison and ranking. In adapting WSM to assess landscape aesthetics along railway routes, weights are assigned to different landscape features visible from the train, such as rivers, forests, and fields, based on their aesthetic contributions, while less appealing features like industrial areas are assigned negative weights. Aerial photography supports the assessment of visibility and categorization of views. A total scenic score is then calculated for each railway segment, allowing for a comparative analysis that highlights scenic value and enhances the overall travel experience[6].

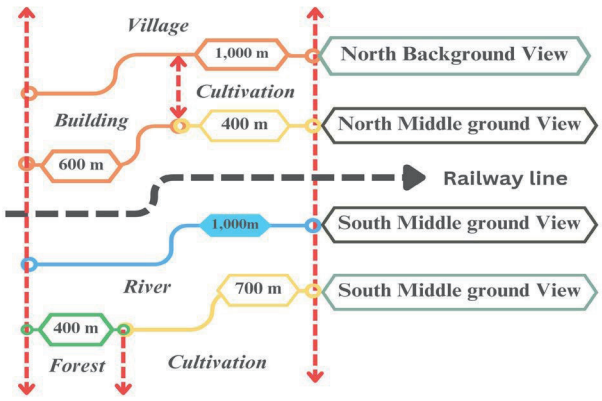

Fig.2 Railway Landscape Data Collection Process

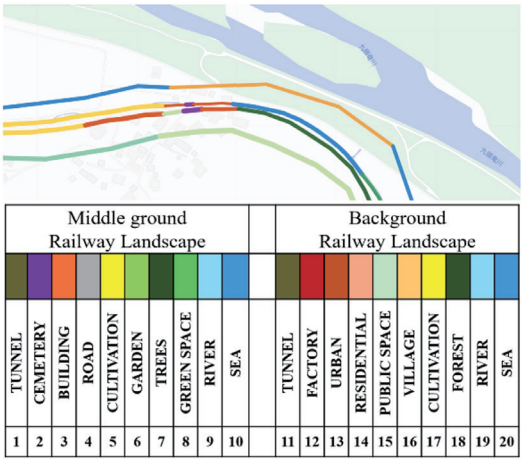

Fig.3 Railway Landscape Elements
(https://www.google.com)

Fig.2 depicts the Railway Landscape Data Collection Process. It shows the classification of landscape elements into middle ground and background views, segmented by their distances from the railway line. The middle ground includes closer elements such as buildings, cultivation, and rivers, while the background includes more distant elements like villages and forests. Measurements of these elements are taken in meters on both the north and south sides of the railway.

Fig.3 illustrates the categorization of railway landscape elements into two main groups: middle ground and background views. Each landscape element is assigned a distinct color, which helps in the systematic identification and analysis of the visual components along the railway route. The middle ground elements include features that are closer to the railway line, such as tunnels, buildings, and rivers. These elements directly impact the immediate visual experience of passengers and are represented by one set of colors. The background elements, which include features that are further away like factories, forests, and residential areas, contribute to the broader scenic context and are depicted using a different set of colors.

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Table 1 Railway Landscape Elements Weight Value

No.	Name of Criteria	Weight Value (Wj)
	Middle ground	
1	TUNNEL	-0.2
2	CEMETERY	0
3	BUILDING	0
4	ROAD	0
5	CULTIVATION	0.1
6	GARDEN	0.1
7	TREES	0.1
8	GREEN SPACE	0.1
9	RIVER	0.15
10	SEA	0.2
	Background	
11	TUNNEL	-0.2
12	FACTORY	-0.1
13	URBAN	0.03
14	RESIDENTIAL	0.05
15	PUBLIC SPACE	0.05
16	VILLAGE	0.07
17	CULTIVATION	0.1
18	FOREST	0.1
19	RIVER	0.15
20	SEA	0.2
	Sum of Weight Value	**1**

$$A_i^{WSM-score} = \sum_{j=1}^{n} W_j X_{ij}$$

$A_i^{\text{WSM-Score}} = Score_{total}$

n = Number of Landscape Elements (No.1-20)

W_j = Weight Value of each Landscape Elements

X_{ij} = matrix value x
(Railway landscape Distance Meters)

Fig.4 Weight Sum Model (WSM)

$$Score_{average} = \frac{Score_{total}}{Distance_{total}}$$

$Score_{average}$ = Average Score per Unit of Distance

$Score_{total} = A_i^{\text{WSM-Score}}$

$Distance_{total}$ = Distance Between Railway Stations or
Total Distance of Railway Line

Fig.5 Average Score per Distance

The Weighted Sum Model (WSM) is employed in this study as a direct and prevalent method for multi-criteria decision-making. This model entails assigning weights to various criteria reflecting their importance, and subsequently summing these weights to compute a total score for each option. This scoring facilitates the comparison and ranking of

different options based on their performance relative to the weighted criteria. In a prior study, WSM was used effectively to select optimal candidates for academic administration roles by weighing criteria pertinent to the position, such as qualifications, experience, and skills. Each candidate was evaluated against these criteria, and the accumulated scores helped identify the most suitable individual for the role.

Table 1 presents the weight values (Wi) assigned to various landscape elements observed from the Hapi-Line Fukui, categorized into middle ground and background elements. Each element is assigned a weight value based on its visual significance and impact on the overall landscape rating. For the middle ground elements, a tunnel has a weight value of -0.2, indicating a negative impact due to obstructed views. Cemeteries, buildings, and roads have a neutral impact with a weight value of 0.0. Cultivation, gardens, trees, and green spaces each have a positive impact with a weight value of 0.1. Rivers have a strong positive impact with a weight value of 0.15, while the sea has the highest positive impact with a weight value of 0.2, due to its expansive and appealing views. In the background elements, tunnels again have a negative impact with a weight value of -0.2, and factories have a negative impact with a weight value of -0.1 due to industrial and less attractive views. Urban areas have a slight positive impact with a weight value of 0.03, while residential areas and public spaces each have a moderate positive impact with weight values of 0.05. Villages have a positive impact with a weight value of 0.07, and cultivation and forests each have a positive impact with a weight value of 0.1. Rivers again have a strong positive impact with a weight value of 0.15, and the sea has the highest positive impact with a weight value of 0.2. The sum of the weight values for both middle ground and background elements equals 1, ensuring a balanced and comprehensive evaluation of the landscape's visual appeal. This weighting system is crucial for quantifying and comparing the aesthetic value of different segments along the railway, providing a structured method for landscape assessment.

Fig. 4 illustrates the Weight Sum Model (WSM), a mathematical framework used to calculate the total score ($A_i^{WSM\text{-}score}$) of landscape elements observed along the railway line. This model aggregates the contributions of various landscape elements to assess the overall aesthetic value of the scenery. The formula used is ($A_i^{WSM\text{-}score}=\sum_{j=1}^{n} W_j X_{ij}$) In this formula, ($A_i^{WSM\text{-}Score}$) represents the total score of the landscape segment (i) . The variable (n) is the number of different landscape elements considered, ranging from 1 to 20. Each landscape element j is assigned a weight value (W_j) based on its visual significance. The matrix value (X_{ij}) corresponds to the distance in meters that the landscape element (j) occupies within segment (i). By summing the products of the weight values and their corresponding distances, the WSM provides a total score that reflects the cumulative aesthetic impact of all landscape elements within a segment.

Fig. 5 introduces the concept of the average score per unit distance ($Score_{average}$), which further refines the assessment of landscape quality by normalizing the total score over the length of the railway segment. The formula used is $Score_{average}=(Score_{total}/Distance_{total})$. In this formula ($Score_{average}$), is the average score per unit distance, offering a standardized measure of landscape quality. ($Score_{total}$) is the total score obtained from the WSM ($A_i^{WSM\text{-}Score}$), and $Distance_{total}$ represents the total distance of the railway segment or the distance between two stations. By dividing the total score by distance, this calculation provides a clear metric for comparing the aesthetic value of different segments, regardless of their length. This approach ensures that longer segments do not inherently score higher simply due to their length, allowing for a fair comparison based on the quality of the landscapes observed.

The Weighted Sum Model (WSM) is extensively used to evaluate landscape aesthetics along railway routes. It assigns weighted values to various landscape elements, such as rivers, forests, and fields, based on their aesthetic contributions, enhancing the visual appeal of the routes. Conversely, less attractive elements like industrial zones and tunnels receive negative weights. Aerial photography supports this process by assessing visibility and categorizing views. A total scenic score is calculated for each railway segment, enabling comparative analysis. This method not only improves route attractiveness but also aids in urban planning, enhancing passenger experiences and fostering environmental engagement.

4.Results

Through detailed data collection and analysis focused on the scenic effectiveness of views from trains traversing various railway lines in Fukui Prefecture, valuable insights into the visual appeal of these routes to passengers have been revealed.

The findings highlight the diverse scenic qualities across the railway network, with certain segments and lines standing out due to their exceptional natural and cultivated landscapes. The collected data and subsequent statistical analysis provide a comprehensive overview of the landscapes between stations, underscoring the unique characteristics of each railway line.

High evaluation scores were typically given to sections featuring expansive agricultural areas and natural settings, including forests, rivers, and seas. Medium scores were assigned to segments where residential structures and infrastructure blend with gardens and agricultural zones. Lower scores were attributed to routes passing through extensive industrial areas or sections where views are predominantly obstructed. A negative score was assigned in cases where views were completely absent, such as when trains pass through tunnels.

The analysis enables a focused examination of scenic landscapes situated between stations along the railway route. By thoroughly analyzing segments that received high scores, researchers have pinpointed specific characteristics that enhance the visual appeal of these areas. Detailed investigation of landscape elements like natural water bodies, pristine forests, and picturesque agricultural lands has deepened the understanding of what contributes to their high valuation. This refined knowledge emphasizes the importance of these features, highlighting them as key attractions of the railway journey.

The section of the Hapi-Line Fukui between Uchinoya Station and Hosoroki Station stands out notably, having achieved a high scenic effectiveness score of 19.24. This segment is distinguished by its picturesque views of villages, agricultural fields, forests, and mountains. These elements combine to offer passengers a vivid and captivating visual experience as they travel along this part of the railway line.

Table 2 The Hapi-Line Fukui Data

Hapi-Line Fukui				
Landscape Between Station		**Landscape Rating**		
Station 1	**Station 2**	**West**	**East**	**Avarage**
1.Ushinoya	2.Hosorogi	17.66	19.24	18.45
2.Hosorogi	3.Awaraonsen	9.39	14.34	11.86
3.Awaraonsen	4.Maruoka	15.41	12.80	14.11
4.Maruoka	5.Harue	9.16	12.64	10.90
5.Harue	6.Morita	0.96	-0.37	0.30
6.Morita	7.Fukui	6.33	1.66	4.00
7.Fukui	8.Echizen-Hanandō	2.60	0.58	1.59
8.Echizen-Hanandō	9.Ōdoro	6.81	9.19	8.00
9.Ōdoro	10.Kita-Sabae	8.32	17.04	12.68
10.Kita-Sabae	11.Sabae	-0.01	14.37	7.18
11.Sabae	12.Takefu	0.21	-0.12	0.05
12.Takefu	13.Ōshio	10.91	11.86	11.38
13.Ōshio	14.Nanjō	15.55	15.03	15.29
14.Nanjō	15.Yunoo	16.61	16.19	16.40
15.Yunoo	16.Imajō	5.28	-1.90	1.69
16.Imajō	17.Minami-Imajō	-3.32	-6.20	-4.76
17.Minami-Imajō	18.Tsuruga	-31.97	-34.14	-33.05
	Weighted Average	5.29	6.01	5.65

The Hapi-Line Fukui starts its journey at Ushinoya Station near the mountainous border region adjacent to Kanazawa, traversing expansive agricultural plains as it approaches the city of Fukui. From there, the route climbs into higher mountainous terrain before descending through a lengthy tunnel that leads to Tsuruga Station. The line's journey from north to south follows a meandering path that showcases a wide array of landscapes, ranging from rural tranquility to rugged mountainous vistas, encapsulating the diverse geographical features of the region.

Table 2 illustrates the ranking of landscapes between various stations along the Hapi-Line Fukui, assessing landscape ratings for both the west and east directions, and providing an average score for each segment. The information in the table represent the mean scores derived from passenger evaluations of the views they encountered while traveling these routes.

The average landscape rating was calculated using the Weighted Sum Model (WSM), which considers the landscape's visual appeal from both sides of the train. The highest score is observed between Ushinoya and Hosorogi stations in the east direction, with a rating of 19.24 and an average of 18.45, indicating that this segment features particularly scenic natural and

agricultural landscapes. Conversely, the lowest score is between Minami-Imajō and Tsuruga stations in the west direction, with a rating of -31.97, suggesting that this segment primarily passes through tunnels or areas with less appealing natural and agricultural scenery.

The landscape ratings were determined based on factors such as the length of travel through natural areas, rivers, forests, agricultural fields, and village gardens, which are considered positive attributes. Negative factors include tunnels and industrial facilities, as detailed in Table 1 using the WSM approach. The average scores for each route segment enable researchers to clearly identify the most and least appealing landscapes along the railway. This analysis provides a deeper understanding of the visual characteristics of railway journeys in different segments, offering insights into the scenic attributes that enhance or detract from the travel experience.

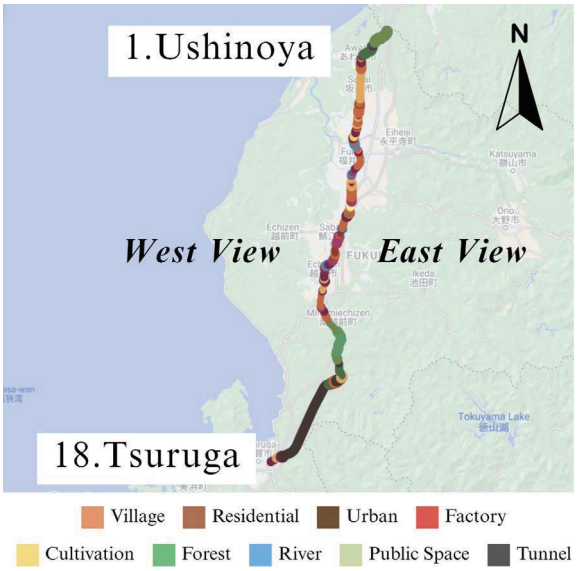

Fig.6 Map of the Hapi-Line Fukui
(https://www.google.com)

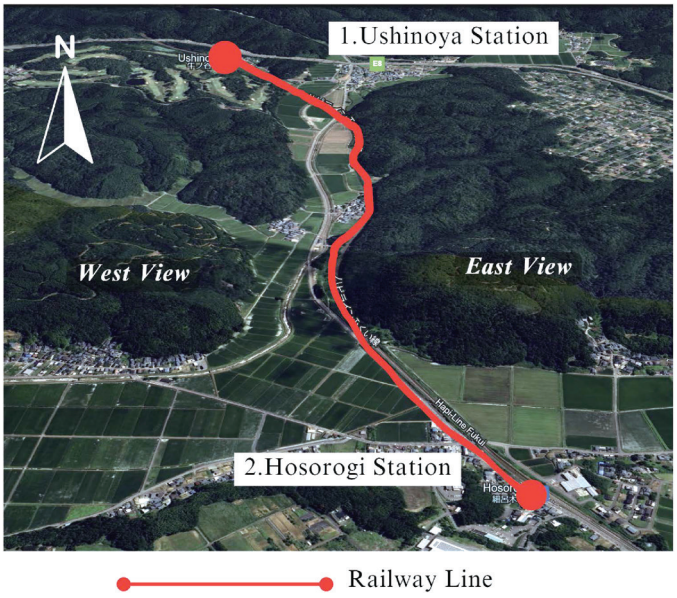

Fig.7 Landscape between Ushinoya to Hosorogi station.
(https://earth.google.com)

Fig.6 illustrates the geographical layout of the Hapi-Line Fukui, a railway line stretching from Ushinoya station in the north to Tsuruga station in the south. The map highlights the various segments of the route, showing the west and east views experienced by passengers. The color-coded segments represent the aesthetic value ratings of the landscapes visible from the train windows, as assessed in the study. Green and yellow hues indicate areas with higher aesthetic appeal, while red and brown hues signify segments with lower scenic value. This visual representation provides a clear overview of the diversity in landscape quality along the Hapi-Line Fukui, aiding in the understanding of how different segments contribute to the overall travel experience. The map serves as a valuable tool for identifying key areas of scenic interest and potential points for tourism development along the railway line.

Fig. 7 presents the landscape view between Ushinoya and Hosorogi stations, which has received the highest aesthetic value ratings in the study. This segment is particularly noted for its natural beauty and expansive agricultural areas. The west view showcases lush green fields and rural landscapes, while the east view highlights a mixture of dense forests and cultivated land. The combination of these scenic elements contributes to the high evaluation score, making this section of the Hapi-Line Fukui an exemplary case of how natural and agricultural beauty can enhance the travel experience. The map visually underscores the significance of this segment, illustrating why it stands out as the most aesthetically pleasing part of the railway route.

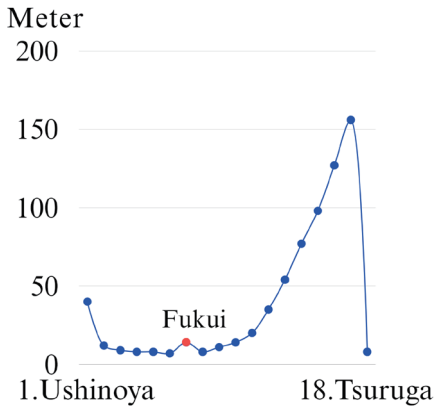

Fig.8 Elevation of the Hapi-Line Fukui

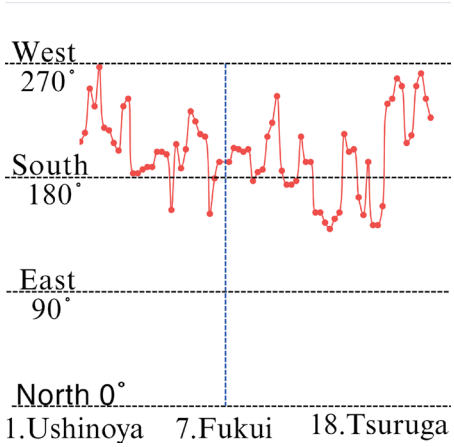

Fig.9 Direction of the Hapi-Line Fukui

Fig.8 depicts the elevation profile of the Hapi-Line Fukui, spanning from Ushinoya station to Tsuruga station. The vertical axis represents elevation in meters, while the horizontal axis lists the stations from Ushinoya (station 1) to Tsuruga (station 18). The elevation starts relatively low at Ushinoya station, with minor fluctuations until it reaches Fukui, marked by a red dot, where the elevation is still modest. From Fukui station onwards, the elevation begins to increase significantly, peaking just before reaching Tsuruga station, where the elevation sharply drops. This elevation change is indicative of the varying topography along the railway line, affecting both the scenic views and the engineering requirements of the railway. The substantial increase in elevation towards Tsuruga station contributes to the diverse landscape experiences for passengers, as different altitudes offer varied visual perspectives and natural environments.

Fig. 9 illustrates the directional changes of the Hapi-Line Fukui from Ushinoya (station 1) to Tsuruga (station 18). The vertical axis represents compass directions, with 0° indicating north, 90° indicating east, 180° indicating south, and 270° indicating west. The horizontal axis lists the stations along the route, with a marked midpoint at Fukui (station 7). The graph shows that at the beginning of the journey, the train travels primarily in a southerly direction from Ushinoya station. As the railway progresses, it makes several turns towards the southwest and then towards the northwest. These directional shifts reflect the railway's adaptation to the geographical and topographical features of the region, navigating around natural and man-made obstacles while following the terrain's contours.

Although passengers might not be acutely aware of these directional changes and the varying slopes during their journey, this diagram provides a clear and rapid understanding of the railway's travel characteristics. The visual representation highlights how the train's direction changes multiple times throughout the route, adapting to the landscape and enhancing the overall scenic variety experienced by travelers. This information is particularly useful for understanding the complexity and diverse nature of the journey along the Hapi-Line Fukui.

Table 3 categorizes landscape ratings between Hapi-Line Fukui station segments into Very High, High, Medium, Low, and Very Low. Segments with Very High ratings (≥ 15) include Ushinoya station-Hosorogi station, Nanjô station-Yunoo station, and Ôshio station-Nanjô station, indicating the most visually appealing sceneries. High-rated segments (10-14.99) such as Awaraonsen station-Maruoka station and Odoro station -Kita-Sabae station offer highly appealing landscapes. Medium-rated segments (5-9.99) like Echizen-Hanandô station-Odoro station provide moderate value. Low-rated segments (0-4.99) include Morita station-Fukui station and Yunoo station-Imajo station. Very Low segments (< 0) like Minami-Imajo station -Tsuruga station indicate unattractive landscapes.

Fig. 10 illustrates the sequence of landscape value ratings along the Hapi-Line Fukui, from Ushinoya (station 1) to Tsuruga (station 18). The vertical axis represents the landscape rating values, ranging from -40 to 20, while the horizontal axis lists the stations in sequence. The line graphically represents the changing landscape values across different segments of the railway route. The segment between Ushinoya station and Hosorogi station (stations 1-2) has the highest landscape value, with a rating of 18.45, indicating a highly scenic area with natural beauty and agricultural landscapes. The value remains relatively high through several segments but experiences fluctuations. Notable points include the segment between Morita station and

Fukui station (stations 5-6) with a value of 4.00, and between Nanjo station and Yunoo station (stations 13 -14) with a value of 16.40.

The landscape value drops significantly in the segment between Minami-Imajō station and Tsuruga station (stations 17-18), reaching a low of -33.05. This sharp decline suggests a less scenic route, likely characterized by tunnels or less visually appealing industrial areas. Fig.10 provides a clear visual representation of how the scenic value varies along the Hapi-Line Fukui. While passengers may not notice these changes in landscape value and elevation during their journey, this diagram offers a comprehensive understanding of the railway's scenic attributes. By highlighting the segments with the highest and lowest landscape values, Fig.10 underscores the diverse visual experiences passengers can expect along the route.

Hapi-Line Fukui			
Landscape Between Station		Landscape Rating	Landscape
Station 1	Station 2	Avarage	Value
1.Ushinoya	2.Hosorogi	18.45	Very Hight
2.Hosorogi	3.Awaraonsen	11.86	Hight
3.Awaraonsen	4.Maruoka	14.11	Hight
4.Maruoka	5.Harue	10.90	Hight
5.Harue	6.Morita	0.30	Low
6.Morita	7.Fukui	4.00	Low
7.Fukui	8.Echizen-Hanandō	1.59	Low
8.Echizen-Hanandō	9.Ōdoro	8.00	Medium
9.Ōdoro	10.Kita-Sabae	12.68	Hight
10.Kita-Sabae	11.Sabae	7.18	Medium
11.Sabae	12.Takefu	0.05	Low
12.Takefu	13.Ōshio	11.38	Hight
13.Ōshio	14.Nanjō	15.29	Very Hight
14.Nanjō	15.Yunoo	16.40	Very Hight
15.Yunoo	16.Imajō	1.69	Low
16.Imajō	17.Minami-Imajō	-4.76	Very Low
17.Minami-Imajō	18.Tsuruga	-33.05	Very Low

Table 3 Sequence of Railway Landscape Value

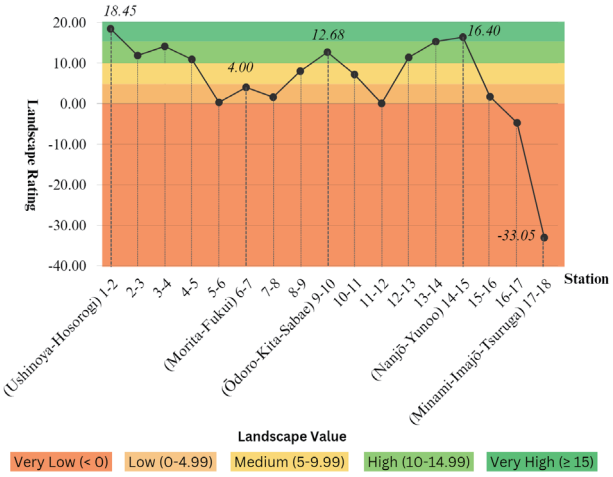

Fig.10 Sequence of Railway Landscape Value

The diagrams collectively enhance the understanding of the Hapi-Line Fukui's geographical and scenic characteristics. Fig.6 and Fig.7 provide a clear visual of the route and highlight segments with the highest aesthetic value, aiding in identifying key scenic areas. Fig.8 details the elevation changes, elucidating the topographical challenges and visual diversity of the journey. Fig.9 illustrates directional changes, helping to comprehend the route's complexity. Finally, Fig.10 offers a sequential analysis of landscape values, identifying both visually appealing and less attractive segments. Together, these diagrams offer comprehensive insights into the travel experience and guide tourism development along the railway.

5.Discussion

The comprehensive analysis of landscape data from the Hapi-Line Fukui stations underscores the pivotal role that scenery plays in daily rail travel. This study extends beyond mere aesthetic appreciation, cataloging the unique scenic elements characteristic to each railway line. The adoption of detailed visual analysis through qualitative scoring demonstrates how landscapes influence everyday passenger experiences, promoting the use of local trains and fostering community engagement with the environment. The methodology introduced in this study provides a novel perspective on local landscapes, highlighting the significance of both natural and urban scenes in the lives of residents.

By revealing variations in scenic quality across different routes, the study underscores the importance of integrating landscape considerations into regular rail service operations and community planning. Identifying sections with high scenic scores not only fosters environmental and cultural awareness but also assists local authorities and railway operators in crafting journeys that resonate with residents' sense of place. This strategy enhances the connection between daily commuters and the landscapes they traverse, potentially enriching their daily experience.

The findings open avenues for further research into how landscapes affect regular commuters and how seasonality may alter these perceptions. Future studies could engage community feedback to deepen insights into how scenic environments

contribute to resident well-being and satisfaction. This approach to quantifying and assessing train-view landscapes underscores their crucial role in enhancing life quality for the people of Fukui Prefecture, emphasizing the value of incorporating natural landscape element into local transportation and urban planning. This study affirms the essential bond between a region's visual landscape and its inhabitants' sense of home and community.

6.Conclusions

This study's in-depth assessment of the Hapi-Line Fukui highlights the significant role of scenery in train travel. By quantifying scenic landscape elements and comparing views across different routes, the research identifies segments where natural landscapes notably enhance the journey. This variation in scenic quality underlines the importance of integrating these landscapes into railway planning and promotion. The methodology employed, combining distance measurements with landscape scoring, showcases the region's natural and cultural assets, promoting local railway use. Scenic quality emerges as a crucial factor in enriching the passenger experience and serves as a unique attraction for railway travel.

Furthermore, the study posits that railways could act as platforms for environmental and cultural education, deepening passengers' connection to their surroundings. Future research could build on these findings by incorporating passenger feedback to provide a more comprehensive perspective on the visual appeal of train travel. This study highlights the untapped potential of scenic assessments in rail travel and tourism, advocating for a greater appreciation of the journey's visual components alongside the destinations. The quantified landscape element of Fukui's railway landscapes provides actionable insights for stakeholders and reaffirms the significant role of scenic views in enhancing regional travel and promoting environmental appreciation.

In conclusion, this study systematically demonstrates the profound impact of scenic landscapes on rail travel experiences in Fukui Prefecture. Through quantitative assessments of scenic quality, specific routes have been identified that offer superior visual experiences, potentially attracting more passengers and enhancing overall satisfaction. Integrating natural and cultural vistas into daily commutes not only improves the quality of life for residents but also positions the rail network as a key component of regional tourism and environmental stewardship. The findings underscore that scenic landscape elements is an essential element of successful rail service operations. Recognizing and leveraging this potential could lead to more sustainable and enjoyable public transportation systems. Future strategies should aim to integrate these insights into local and broader transportation policies, ensuring that scenic values are fully realized and preserved for future generations. This approach not only boosts the appeal of rail travel but also supports broader community well-being and environmental conservation goals.

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