



A tale of two cyclists: a cross-cultural comparison between Taiwanese and Filipino perceptions on cycling infrastructure landscapes

Jose Antonio Bimbao¹ · Sheng Jung Ou²

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Abstract

How is cycling culture defined? Because the word “culture” brings with it deep complexities, there is a need to understand varying contexts in looking for suitable strategies toward the advancement of cycling culture. The stage for cycling culture is the landscape where cycling infrastructure can be properly provided. With development, an influential element would be economic capacity. The paper explores the influence of the economic development divide by comparing cyclist perception between developed and developing countries, namely Taiwan and the Philippines. An online survey between 122 Taiwanese and 111 Filipino cyclists was conducted to find out the landscape needs of people to consider cycling transport based on affordances in the landscape. The variables selected were based on landscape elements for cycling as a commuting activity. The data were processed through factor analysis to reveal latent landscape needs to profile cycling needs. Two factors were identified as ‘environmental’ and ‘civil facilities.’ The factor loadings were then compared based on the nationalities which revealed that the bike riding motivation were different with relating to the context of their respective environment and similar with the basic infrastructural demands.

Keywords Cross-cultural comparison · Cycling civil facility · Cycling environment · Cycling motivation · Developed country · Developing country

Introduction

The landscape is the stage where cycling culture flourish. Cycling infrastructure plays a critical role to provide an environmentally acceptable for bike use. When a critical mass of people cycling is reached, then a sense of cycling culture is felt. In the urban realm today, boosting cycling culture promises to address contemporary issues on health. Because it mainstreams bike use, it introduces cycling as a mode of transport called active mobility (Government Office for Science 2019). Active mobility improves the lifestyle of the public as it uses exercise for commuting.

Behind cycling culture is the influence of economic development on cycling infrastructure (Chang and Hsu 2018).

Like any other urban design element, there is an economic aspect that dictates progress. The aim of this article is to explore this difference by conducting a cross-cultural comparison between cyclists from a developed and developing country. Taiwan is selected as the developed country, while the Philippines is selected as the developing country. The two different economic backgrounds translate to different conditions and experiences of the cycling infrastructure landscape.

In Taiwan, cycling has become an accepted part of the culture (Hsieh et al. 2021). The country has built a cycling infrastructure network that extends its reach from the basic mode of travel to tourism. At the capital city of Taipei, has seen a growth of bike lanes from 218.6 km in 2008 to 504.5 km in 2020 (Taipei City Urban Competitiveness Indicators System 2021). These developments are part of the local government’s movement to strengthen urban mobility through transit-oriented development (Chang 2018). It is also aligned with the growing leisure agriculture trend that capitalizes on the landscape (Tao et al. 2021). The mainstreaming of cycling presents an opportunity for the country to be a global model for bike tourism (Chen and Lee 2017).

✉ Jose Antonio Bimbao
s10912906@gm.cyut.edu.tw

¹ Architecture and Urban Design, College of Design, Chaoyang University of Technology, Taichung, Taiwan

² Department of Landscape and Urban Design, College of Design, Chaoyang University of Technology, Taichung, Taiwan

The bikeway image that Taiwan offers has been recognized for its tourism value (Hsieh et al. 2021).

The Philippines, on the other hand, is still at its young stages toward acceptance of bike use and cycling culture. Different approaches are still being considered to pursue this shift in development (Sharmeen et al. 2021). It has been identified to be rooted in economic and technological factors that hinder growth toward more sustainable modes of transport (Guno et al. 2021). Not until the health crisis brought to the country by COVID-19 has cycling been acknowledged by policymakers to cater to the public as a solution to the current transport crisis. The National Economic and Development Authority (2021) has acknowledged the possible economic ramifications of the increasing transport shortage because of transport inflation from 2.6% in 2019 to 9.6% in 2020. The agency sees a connection between the transport issue and bike use as bike imports have increased from one million units in 2019 to 2.1 million units in 2020. In response to this, the current government has committed to working on 500 km of bike lanes for its people (Chiu 2021).

Historically, the growth of cycling as an option for commuting can be traced to the lack of efficient mobility options one can take to navigate the environment. Countries such as China and Taiwan began their cycling culture from the lower to middle-class demographics considering the bike as a tool for mobility to make up for transport infrastructural inefficiencies (Ye et al. 2020). The momentum of bike use continues through improvements of socio-technical systems in the country (Morgan 2017). In addition, when these countries progress in development, this study assumes that improvements include road infrastructures and economic growth leading to more public and private transport options from buses, trains, to private vehicles—a reflection of the substitution effect (Power 2005). Under the project entitled “Public Transportation Data eXchange Platform” initiated in 2016, further integration of public transport services has been realized (Chang et al. 2019).

A grassroots movement was vital to begin a momentum for cycling. For the Philippines, the paradigm shift is brought by the middle class who look for ways to get from one place to another in a more sustainable, environmentally conscious way (Uy and Tapnio 2021). One additional goal added to the current grassroots movement is the focus on health for both the human body and the surroundings. Policymakers in the Philippines must consider the grassroots movement as a co-design technique to enrich the growth of the cycling culture (Perez et al. 2021).

Taiwan is at a more mature stage in its cycling infrastructure development. Currently, the country aims for ‘green loyalty’ from its citizens by elevating the bike-sharing mode of transport (Liang et al. 2021). Integrations with technology are important in this stage, and the alignment of the smart city movements in the country is observed (Ji

et al. 2021). In Taichung City, Taiwan, Bimbao and Chien (2021) observed the increasing use of more bike routes that match the local government bike path development in the city through crowdsourced data. At the same time, further analysis of their bikeways is still implemented to improve contemporary approaches (Lin et al. 2020). The richness of the existing cycling culture in Taiwan opens cycling mobility to other fields such as tourism (Chen and Huang 2020) and environmental protection (Sachs et al. 2019). This cycling infrastructure development is in line to meet relevant landscape and urban design themes from healthy cities and transit-oriented developments. All these themes have a common indicator—cycle routes (Edwards and Tsouros 2008; Webster and Sanderson 2012; Hartanto et al. 2017). It becomes a way engage in active mobility for the benefit of the public and the environment.

Published literature between the two countries reflects the background of economic differences. There is a gap between literature in the nature of the paper’s topic. Taiwan has been constantly producing literature on the value of the cycling environment such as Yeh et al. (2021) and extending to other fields like health (Liou et al. 2021) and transport safety (Wang and Schrock 2021). On the side, there is limited published literature about cycling in the Philippines such as the work of Castro and Josef (2020) that calls for the need of bicycle infrastructure to boost urban bicycle commuting.

Moving forward, both countries gain from this article. Policymakers from Taiwan can validate its cycling culture development, while policymakers Philippines can discover the context of cycling culture development. This study speculates that through examination of what landscape affordance motivates a person to ride a bike, differences between the landscape of developed and developing countries shall be revealed.

Literature review

In assessing the success of cycling infrastructure, it is vital to integrate the human infrastructure. The human infrastructure examines human motivation while cycling infrastructure provides the appropriate landscape. The integration of cycling and human infrastructures is contained within the realm of economic development that is translated to general transport infrastructure.

Human infrastructure is defined by Nello-Deakin and Nikolaeva (2020) as critical components to encourage cycling. Cycling in society needs time to build up, and the human dimension influences its trajectory. The human infrastructure studied was composed of seven factors namely, access to a bicycle is easy and inexpensive, cycling is more competitive than other forms of transport, cycling is part of the Amsterdam lifestyle, there exists a social pressure to

cycle, the city is built for cycling, cycling is fun and enjoyable, and cycling is indispensable for grocery shopping and school trips. These factors highlight the social influence of human experience that add value to cycling mobility for the society.

Nikolaou et al. (2020) conducted an exploratory factor analysis (EFA) to explain factors that hinder people who have no cultural/lifestyle cycling background to ride a bike. Twenty variables were examined through a survey. The variables upon factor analysis revealed the two factors named as “Socio-Demographic” and “Trip Characteristics.” “Socio-demographic” had observed variables of age, income, and education. On the other hand, “Trip Characteristics” had observed variables of route length, transport mean, and route time. The study, too, focused on the human aspect of determining deterrents for the choice to select the bike as a mode of transport. These two factors provided a clearer picture of why commuters have an interest in biking but do not engage in cycling commutes.

Wu (2019) condensed variables for the ideal bike commuting landscape through the fuzzy Delphi method. Sixteen variables were identified; ‘availability of signages,’ ‘road width,’ ‘visibility,’ ‘road drainage,’ ‘vertical clearance,’ ‘designated lane within the road,’ ‘proximity to mass transport,’ ‘proximity to commercial areas,’ ‘road cleanliness,’ ‘availability of bike parking,’ ‘availability of sun shading,’ ‘separated bike lane from the road,’ ‘flat slope,’ ‘lesser stops,’ ‘fresh air,’ and ‘scenic attractions.’ These variables describe a preferred landscape for cycling infrastructure.

The development of cycling culture is context-specific. Through regression analysis from the data of the Dutch National Travel Survey of 2010–2014, Gao et al. (2018) suggested that cycling is context specific. Environmental characteristics and cycling duration are linked, implying the importance to consider both the natural and the built environment to have an influence on the cycling activity.

The general macro-economic view of supply and demand is reflected in the landscape (Power 2005). Using the basic concepts of the law of supply and demand, cycling motivation with landscape infrastructure can be understood. The supply of cycling infrastructure or level of development and the demand of user preference results in a valuation of variable rating scores. This gives a framework for the evaluation of identified variables for the paper. With the theory comes consideration for the substitution effect. In the case of better infrastructural development, it can mean more mobility options that can be alternatives for bike use for transport.

Diamond and Spence (1984) explain the linkage of infrastructure and economic development. The growth theory further details the connection that more development leads to economic growth (Straub 2008)—a practical assumption for contextualizing the difference of Taiwan from the Philippines that can be observed with more advanced urban

cycling provisions in the landscape. For the case of the Philippines as a developing country, the rapid urbanization will be a strong driver toward more demands for infrastructure to keep these countries competitive globally (Straub and Terada-Hagiwara 2010).

Materials and methods

The flow of cross-cultural analysis was required to establish grounds for statistical comparison through an online survey and different multivariate techniques. The survey was used to gather data from Taiwanese and Filipino cyclists. Independent t tests and factor analysis were implemented to elaborate on the descriptive information provided from the data gathering.

An online survey was conducted during May of 2021 for Taiwanese and Filipino cyclists using Google Forms. The number of respondents was as follows: 122 Taiwanese and 111 Filipino cyclists. Two versions of the form circulated online for a span of 2 weeks—an English version for Filipinos and a Mandarin version for Taiwanese respondents. The results from the feedback of these respondents provided a glimpse to the differences in conditions and experiences of their respective cycling landscapes for comparison and analysis. It is not representative of the entire situation, but it offered insights into possible points of discussion in the context of exploring connections between cycling development and economic gap.

Aside from demographic information such as gender, age range, and cycling behavior, the survey asked about landscape affordances that motivate bike activity. The question was “As a cyclist, rate the following factors on whether these motivate you to ride a bike.” A five-point Likert scale was provided to consider each item with the range of the following spectrum—“strongly discourages you to bike (1)”, “discourages you to bike (2)”, “doesn’t matter to your bike activity (3)”, “encourages you to bike (4)”, and “strongly encourages you to bike (5)”. Sixteen variables were drawn out from the research of Wu (2019), which were: ‘availability of signages,’ ‘road width,’ ‘visibility,’ ‘road drainage,’ ‘vertical clearance,’ ‘designated lane within the road,’ ‘proximity to mass transport,’ ‘proximity to commercial areas,’ ‘road cleanliness,’ ‘availability of bike parking,’ ‘availability of sun shading,’ ‘separated bike lane from the road,’ ‘flat slope,’ ‘lesser stops,’ ‘fresh air,’ and ‘scenic attractions.’

The demographic information recorded was about the respondents’ background: gender, age, nationality, description of environment where they live, description of the environment that they prefer and their cycling behavior: bike activity frequency (in a week), cycling as a social activity, type of primary bike used, number of bikes owned,

description of bike activity, typical bike activity distance, and typical bike elevation awareness.

The description of the bike activity variable was based on the ChaoYang University of Technology Technical Assistance in 2018 of bikeway development for the local government of Taichung City that categorized cycling types to be of Family, Tourism, and Challenge. Family activity refers to biking in an environment where a wide range of age groups from children to the elderly can ride such as in a protected park-like bikeway. Tourism activity refers to biking for reasons of traveling to reach scenic locations that could possibly be a multi-day activity. Lastly, the challenge activity describes riding a bike for fitness purposes.

The rest of the other variables for the descriptive analysis were completed with typical categorical or interval responses. These descriptive variables were tested with Chi-square analysis. Significant differences resulting from the test enriched the discussion.

The results from the respondents were processed through IBM SPSS 26 Software. Factor analysis was run with the following inputs: 16 variables for comparison, dimension reduction, nationalities as the selection variable, and varimax rotation. This step provided the latent factors behind the variables tested. Factor scores were also recorded between the latent factors for further independent *t* test.

Results

The percentage of male and female participants was similar between the two countries with more male than female counts (see Table 1). The Taiwanese cyclists with a 54.9% male to 45.1% female ratio were closer to a balanced gender ratio compared to the Filipino cyclists with a wider gap with 61.3% male to 38.7% female ratio. Underrepresented groups in cycling, including women, have shown preferences that highlight the importance of cycling infrastructure such as protected bike lanes (Garrard et al. 2008; Carrol et al. 2020). This Taiwanese gender trend is in line with the findings of Chi et al. (2019) on personal bike use with 55.7% male and 49.3% female respondents. The differences in the gender ratio could be connected to the sense of inclusivity provided by Taiwan with continuous development of cycling infrastructure as this was not the case in the past with the results of Fang et al. (2011) with 58.9% male and 41.1% female respondents for an exploratory on cycling recreation at the Danshui Riverside Bike Path.

The age range of cyclists from both countries displayed an inverse relationship with younger respondents composed the majority (see Table 1). Bike use compared by age group showed a sharp decrease from the below 30 years old to the 30–59 years old age group in Taiwan, from 70.5 to 16.4%, against a more gradual decrease showed with the Philippine

Table 1 Demographic of respondents

Demographic		Nationality	
		Taiwanese	Filipino
Gender	Male	54.9%	61.3%
	Female	45.1%	38.7%
Age Range	0–29 years old	70.5%	52.3%
	30–59 years old	16.4%	36.0%
	60 years old or greater	13.1%	11.7%
Habitat environment	Urban	53.3%	65.8%
	Urban–riverside	7.4%	6.3%
	Coastal	3.3%	3.6%
	Peri-urban	36.1%	24.3%
Environment preferred	Urban	16.4%	6.3%
	Urban–riverside	19.7%	17.1%
	Coastal	20.5%	25.2%
	Peri-urban	43.4%	51.4%

data from 52.3 to 36.0%. The substitution effect (Power 2005) could be responsible for the difference in the decline of counts in the age group with other alternative modes managed by the Taiwanese government through the PTX such as public buses (City Bus and Intercity Bus), rail (TRA—Taiwan Railways Administration, THSR—Taiwan High Speed Rail, MRT—Mass Rapid Transit, and LightRail), ferry (Ferry, Blue Highway, and Island Ship) and private vehicles. It could also suggest that people tend to choose other modes of transport as age takes away some physicality—the trend of increasing age increases car dependency and lessens active mobility (Government Office for Science 2019).

The respondents' description of their living environment is similar for both Taiwan and the Philippines (see Table 1). Most come from urban areas with almost 60% response—in sync with urban worldwide population trends. This also approximated an alignment with the familiarity of urban landscape context with the two nationalities.

The environmental preferences of respondents also displayed slight differences between the two countries (see Table 1). Urban environment is the least preferred for both nationalities, maybe with the tendency to prefer other landscape types with more recreation potential. The economic difference was echoed again through this table as 93.7% of Filipinos have a higher preference to leave the urban environment for other types of surroundings, seemingly attempting to get them farther away from their urban environment compared to 83.6% of Taiwanese respondents. Together, the overall response had a high preference for peri-urban environments, 43.4% for Taiwanese and 51.4% for Filipinos, indicating a need for these landscapes to be properly managed for bike mobility.

Table 2 illustrates the cycling patterns of the respondents. Similar to Table 1, respondents were separated by

Table 2 Cycling patterns

Cycling patterns		Nationality		Chi-square test	
		Taiwanese	Filipino	Value	Sig
Weekly bike activity	Irregular activity	72.8%	40.9%	25.831	0.000
	1–2 times a week	8.8%	30.0%		
	3–4 times a week	9.6%	14.5%		
	More than 4 times a week	8.8%	14.5%		
Riding socially	Group riding	36.9%	36.0%	66.562	0.000
	Solo riding	63.1%	64.0%		
Primary bike type	Hybrid commuter bike	36.9%	5.4%		
	Road bike	34.4%	32.4%		
	Mountain bike	3.3%	39.6%		
	Folding bike	5.7%	7.2%		
	Touring bike	8.2%	9.9%		
	Other types	11.5%	5.4%		
Type of bike activity	Family	58.2%	39.6%	15.245	0.000
	Tourism	22.1%	17.1%		
	Challenge	19.7%	43.2%		
Typical ride distance	0–20 km	68.0%	50.5%	10.669	0.005
	21–40 km	13.1%	29.7%		
	More than 40 km	18.9%	19.8%		
Typical elevation gain	Unaware	67.3%	41.8%	18.707	0.000
	0–200 m	20.4%	47.3%		
	More than 200 m	12.4%	10.9%		

their nationality. Unlike Table 1 that portrayed a general similarity between the Taiwanese and Filipinos, the cycling patterns result in significant differences with the data collected. These cycling patterns and behaviors distinguish the landscape and experience of the two studied groups.

There was more regular bike frequency from Filipino respondents with 59.1% compared to Taiwanese with 27.2% (see Table 2). The regular bike frequency could be also explained through the substitution effect (Power 2005), similar with the age group comparison. In Taiwan, with more efficient transport available, bike use is not as regular compared to the Philippines where more bike activity was done at a weekly frame at various intervals.

The two countries' respondents leaned toward cycling with regards to 'Riding Socially' (see Table 2). Respondents from both countries exhibit a similar preference at a 63.5% to 36.5% ratio to the value of the social aspect of cycling. As a social activity, it must be considered as an interest community group (Barton 2016) instrumental to cycling culture development. As Nello-Deakin and Nikolaeva (2020) elaborated on, the social nature is a vital human infrastructure for the mobility. While one third of the respondents prefer riding alone, this still contributes to the human infrastructure as illustrated by the distribution per bike activity done in Table 3. More respondents who classify their cycling as Family and Challenge type activities prefer to ride socially, while more cyclists who engage in Tourism type activities

Table 3 Bike activity and riding socially for all respondents

		Riding socially		Chi-square test	
		Yes	No	Value	Sig
Bike Activity	Family	50.7%	47.1%	4.862	0.088
	Tourism	15.5%	27.1%		
	Challenge	33.8%	25.9%		

choose to ride alone. Since tourism activities could take multiple days to reach longer distances, organizing this type of bike ride for a group might require more effort. There is no significant differences between the bike activity it's social aspect for both nationalities.

Taiwanese cyclists primarily use more commuter bikes, while Filipino cyclists use commuter bikes the least (see Table 2). This could be reflective of the difference in commuting cycling infrastructure provided. There is more consideration for the cycling activity in Taiwan by policymakers (Chang and Hsu 2018) since hybrid commuter bikes were commonly used as the primary bike type at 38.5%, a type of bike effective with cycling infrastructure in place. In the case of Philippines, bike riders tend to use more specialized bikes, such as mountain bikes to handle the varied road conditions.

Also, the use of specialized bikes could be connected to the environmental preferences at Table 1 with more

Filipinos leaning toward getting out of the urban setting. The two nationalities mostly selected between the following types of bikes—hybrid commuter bikes, road bikes, mountain bikes, folding bikes, and touring bikes. Bikes that were classified as ‘other types’ consists of electric bikes, single speed bikes, beach cruisers, triathlon bikes and non-responses. A few respondents, all irregular cyclists—6.6% of the Taiwanese and 0.9% of Filipinos, selected not to answer the item—the study assumed that their cycling patterns are based on renting and/or borrowing equipment. In the interest of performing a comparison with a chi-square test, these responses were recorded as ‘other types.’

Bike activity information would typically have distance and elevation (see Table 2) as a basic measure (Nikolaou et al. 2020). For both basic measures, responses from the two countries are significantly different. First, with distance, 49.5% of Filipinos riding farther than 20 km per ride compared to the 68.0% of Taiwanese cyclists who ride within 20 km. Second, with elevation, as 67.3% of Taiwanese respondents seemed to have lesser awareness and lower gains compared to the 41.8% of Filipinos. The classification of elevation was based on the typical mountain landscape that begins around 200 m above sea level, lower elevations are likely hilly areas. Both elevation and distance could be another recognition of the difference between economic development. The perception of ‘smoother’ bike ride with Taiwan’s cycling infrastructure and the closer access to target recreational destinations resonate with its developed economy.

Table 4 compares the two nationalities based on their perception of the cycling landscape. Mean scores of all the variables except for flat slope were higher with Filipino respondents. As framed in the literature review, Filipinos would be more motivated to bike if provided by these affordances in the landscape. This could be interpreted in the context of the lack of cycling infrastructure development in the Philippines—the motivation to bike is higher in the Philippines due to the longing for the respondents to experience development. Through t tests, most of the variables revealed significant differences.

Only one of the sixteen variables was rated higher by the Taiwanese—‘flat slope’ for riding. Their familiarity with the variables of the development in Taiwan does not motivate them as much as the Filipinos to ride a bike. This could be linked to their unawareness of the elevation gain during their bike activity with more infrastructure development.

Taiwanese cyclists gave priority to the following variables to motivate their bike activity; fresh air, separated lane from the road, and road cleanliness. These variables indicate the importance of landscape maintenance and the isolation of bikeways from other modes of transport (Yeh et al. 2021). The least motivating variables were availability of bike parking, proximity to mass transport, and road drainage that described their cycling activity to reach destinations without any issues of security and weather.

Filipino cyclists, on the other hand, emphasized bike ride motivations of fresh air, scenic attraction, and separation of the bike lane from the road. The respondents were least motivated to ride with road drainage, flat slope, and

Table 4 Cycling landscape motivation

Variable	Nationality				Overall		<i>t</i> test		
	Taiwanese		Filipino		M	SD	<i>t</i>	<i>df</i>	Sig
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					
Availability of signages	3.74	0.851	4.10	1.009	3.91	0.945	−2.965	231	0.003
Road width	3.98	0.891	4.46	0.807	4.21	0.883	−4.260	231	0.000
Visibility	3.93	0.994	4.33	0.813	4.12	0.932	−3.334	231	0.001
Road drainage	3.62	0.973	3.94	0.975	3.77	0.985	−2.457	231	0.015
Vertical clearance	3.78	1.110	4.04	0.852	3.90	1.002	−1.971	231	0.050
Designated lane within the road	3.89	1.105	4.41	0.957	4.14	1.066	−3.764	231	0.000
Proximity to mass transport	3.66	1.140	3.74	1.226	3.70	1.180	−0.483	231	0.630
Proximity to commercial areas	3.83	0.906	3.99	1.057	3.91	0.982	−1.267	231	0.206
Road cleanliness	4.11	0.883	4.41	0.835	4.25	0.871	−2.574	231	0.011
Availability of bike parking	3.71	0.992	4.42	0.826	4.05	0.981	−5.908	231	0.000
Availability of sun shading	4.02	0.867	4.51	0.830	4.26	0.882	−4.388	231	0.000
Separated bike lane from the road	4.19	0.965	4.70	0.698	4.43	0.883	−4.540	231	0.000
Flat slope	4.05	0.935	3.82	0.907	3.94	0.927	1.898	231	0.059
Lesser stops	4.02	0.945	4.14	0.939	4.07	0.942	−0.961	231	0.338
Fresh air	4.28	0.938	4.71	0.706	4.48	0.862	−3.951	231	0.000
Scenic attractions	3.88	0.992	4.62	0.751	4.23	0.959	−6.408	231	0.000

proximity to mass transport. These top and bottom-rated variables leaned toward a more recreational riding experience.

The two nationalities both understood the importance of fresh air, separated bikeways, and protection from the sun as a motivation to ride and were not as motivated to ride landscapes because of good mass transport access, good drainage, and vertical clearance. The consensus of cycling from its recreation aspect was revealed. These affordances were important for both nationalities, because most respondents live in an urban environment where these variables are scarcer.

In both countries, it seemed that bikes were more used to travel directly to destinations without the need for transfers to other modes of transport as the proximity to mass transport variable scored the lowest means (see Table 4). The drainage variable showed that cyclists were not as concerned to ride in bad weather. Vertical clearances were also less critical because bike riding positions were lower than other motorized vehicle clearances. Proper maintenance of vertical clearance for other types of vehicles would also be suitable for bike mobility. It would be easy for a cyclist to go around overhead road obstructions such as tree branches.

The variables were examined with Factor Analysis to look for latent reasons critical to bike riding motivation (see Table 5). Two latent factors resulted from the factor analysis. The KMO value was 0.928 with Bartlett's Test significance of 0.000. The two factors reflected the type of affordances that relate to landscape development—"environmental" and "civil" facility factors.

The environmental factor was 'availability of bike parking,' 'availability of sun shading,' 'cleanliness,' 'flat slope,' 'fresh air,' 'lesser stops,' 'scenic attractions,' 'separated bike lane from the road,' and 'visibility.' The factor depicts a recreational experience in a park-like surrounding. Provision of these variables requires working with natural elements that are normally unique to an environment such as air quality or sun exposure.

The civil facility factor, on the other hand, was the 'availability of signages,' 'designated lane within the road,' 'proximity to commercial areas,' 'proximity to mass transport,' 'road drainage,' 'road width,' and 'vertical clearance.' In contrast with the other factor, this factor follows more standardized requirements for variables such as clearance, widths, and drainage. These variables are basic development guidelines, typically connected to engineering, in urban design projects.

Reliability of the data was also analyzed through Cronbach's α (see Table 5). The overall-scale Cronbach's α of the sixteen variables was 0.941. This value could be increased to 0.943 by deleting the variable 'proximity to mass transport.' The cyclist respondents of both nationalities found the variable to be the least important as a motivation to ride a bike supporting the idea that they would choose bike riding to

Table 5 Rotated component matrix of responses

Variable	Environmental factor	Civil facility factor
Fresh air	0.837	
Separated bikeway from the road	0.827	
Cleanliness	0.775	
Availability of sun shading	0.770	
Scenic attractions	0.732	
Lesser stops	0.722	
Visibility	0.700	
Availability of bike parking	0.648	
Flat slope	0.618	
Proximity to mass transport		0.819
Road drainage		0.739
Availability of signages		0.691
Proximity to commercial areas		0.675
Designated lane within the road		0.653
Vertical clearance		0.645
Road width		0.578
Eigenvalue	8.725	1.363
Explanatory variance %	54.530	8.517
Total explanatory variance %	63.048	
The overall-scale Cronbach's α	0.941	
Cronbach's α of each factor	0.926	0.885

arrive at their destinations. The environmental factor variables had a Cronbach's α of 0.926. Deletion of any of nine variables under that factor would not increase the α value, but removal of the variable 'flat slope' would retain the current value. On the other hand, the civil facility factor had a Cronbach's α of 0.885. Similar to the other factor, deletion of any variable under the factor would not increase the reliability rating.

To further analyze the difference between Taiwanese and Filipino responses in Table 4, factor scores are compared in Table 6. Between the two latent factors, only factor scores of the environmental dimension variables exposed significant differences. This contributes to the discussion that environmental is specific to its own landscape context. Developments with objectives to provide these variables do not follow a template form standards like civil facilities.

Discussion

The economic context of Taiwan and the Philippines are different with the latter considered 'developing' and the former as 'developed.' Economic theories and concepts provide an explanation for the differences between the responses from each respective country (Straub 2008). While the two

Table 6 T test between latent factor scores

Latent factor	Nationality				<i>T</i>	<i>df</i>	Sig
	Taiwanese		Filipino				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Environmental	−0.254	1.054	0.279	0.859	−4.248	228.3	0.000
Civil facility	−0.080	0.960	0.088	1.039	−1.277	231	0.203

general classifications of developed and developing deliver a polarizing sense, the understanding of globalization and convergence (Reyes-Ortiz 2001) gives a positive outlook for developing countries. On the other end, developed countries must continue to deliver quality services for their people (Diamond and Spence 1984; Straub and Terada-Hagiwara 2010).

In the exploration of bicycle mobility, the economic gap is visible with the nature of cycling patterns, cycling landscape motivation, and latent factors behind motivation. The level of landscape development of cycling infrastructure is different and can be observed with the feedback of cyclists (Gao et al. 2018). Currently, the difference between the two countries is the bike infrastructure in place in each respective urban centers. While there are more than 500 km of bikeways available in Taipei City alone (Taipei City Urban Competitiveness Indicators System 2021), the Philippine government is still at the early stages of bikeway planning, committing to develop 500 km (Chiu 2021). These missing civil facilities lead to more complex difference in landscape development that motivate people toward bike mobility.

Differences in cycling patterns show inclusiveness with bike use in Taiwan (Hsieh et al. 2021) from the gender balance ratio to the primary bike type used as these values showed differences between Taiwanese and Filipino respondents supported by the data from Table 1. This could be attributed to the existing cycling developments found in Taiwan. The popularity of commuter bikes and family-type rides, shorter bike distances, and insensitivity to elevation welcome more variety of users to feel comfortable with cycling. The opposite can be observed in the Philippines where cycling tends to require more skill as a specialist mode of transport. Filipinos are mostly composed of challenge-type riders who use more bikes for longer distances and climbing higher elevations. These patterns show the level of gap landscape development as cycling infrastructure more advanced in Taiwan—a gap that must be considered to further develop greener mobility in the Philippines through emergent methods like co-designing (Perez et al. 2021).

The landscape was analyzed through variables perceivable in the environment in a cycling activity (Wu 2019). People are at the center of the analysis with human infrastructures (Nello-Deakin and Nikolaeva 2020) essential to establish a critical mass in favor of the mobility. Through

examination of variables that would motivate cyclists, an insight with the human infrastructure for cycling mobility. Differences in cycling motivation also show the familiarity of Taiwanese respondents with the advanced infrastructure. Juxtaposed with the theory of supply and demand, the Taiwanese respondents are less motivated to ride a bike compared to Filipino respondents who are more eager to experience better landscape affordances as a motivation to pedal.

Factor analysis works for understanding meanings behind responses of the cyclists (Nikolaou et al. 2020). Behind these motivations to ride the bike are two latent factors on the cycling infrastructure landscape. First, the environmental factor defines park-like surroundings that capitalize on natural landscape elements specific to a certain site. Second, the civil facility identifies engineering solutions that are typically expected regardless of location, a basic foundation to advance cycling activity for the public (Ke et al. 2019). Only the first factor indicated significant differences between nationalities which can be explained by the landscape development differences of Taiwan and the Philippines, with Taiwan having more cycling development connected to the environment such as bike paths along natural park and river surroundings. On the other hand, this also implied that basic infrastructural conditions are needed by both nationalities as a motivation for bike riding.

For cycling culture to flourish, as in the case of Taiwan, the dynamics of the latent factors provide an explanation. It is the combination of environmental and civil facilities that will lead to cycling mobility. In planning for active mobility, there basic infrastructural affordances must be provided such as proper signages, bike lane requirements, and transport integration. The environmental conditions support these structures by establishing a more cyclist-friendly surrounding.

Going back to the influence of economic development to infrastructure development (Power 2005), the contrasting backgrounds of Taiwan and the Philippines identified points to the general difference of experience with the condition of cycling infrastructure for respondents of each respective country. The inverse relationship with the level of development and motivation to ride a bike is recorded is a possible manifestation of the substitution effect by the offering of other mobility options.

Although there are differences between the two nationalities, there is one valuable similarity. What transcends both nationalities are the social nature of bike riding which is a good way to build stronger bonds within a community (Barton 2016). The role of human infrastructure is critical for building a rationale toward cycling development. The stakeholders must be supportive to guarantee progress.

The study demonstrated the contrasting context of a developed country from a developing country through the lens of cycling mobility. Cycling mobility is investigated as it leads toward healthier landscapes—a responsive solution to emerging global issues (Edwards and Tsouros 2008) of mobility. In Taiwan, cycling culture has flourished as the mobility has extended to other fields like leisure agriculture and medicine. On the other hand, the Philippines is currently experiencing rapid growth of bike ridership that looks for a suitable landscape for cycling culture to mature though bike commuting (Castro and Josef 2020). The country can learn from the growth and development of Taiwan with regards to bike mobility to elevate the current local approaches for active mobility starting from provision of biking civil facilities. The inclusivity based on achieving a better balance of gender ratios (Fang et al. 2011; Chi et al. 2019) and the growth of cycling infrastructure development over the years (Taipei City Urban Competitiveness Indicators System 2021) are positive observations that Philippine planners and decision-makers can look at in developing cycling mobility in the county. This is vital in attracting underrepresented groups such as females to participate in the bike riding supported by the proper facilities.

Further studies can be done to add more detail to the economic background of respondents, their other mobility options, and micro-scale analysis of the cycling landscape. As the study focused on cycling landscape motivations, additional attention to the composition of the cycling environment can be examined. Lastly, further elaboration can be investigated to differentiate the cycling activity purposes between utility and recreation.

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