Assimilating Cycle Park as a Part of Urban Living

Cycling has a century-old history. Originated as the cheapest and practical mode of transportation, the evolution and modernity of cycles have led to become cycling a popular adventure sport. While the first cycling race was held in 1868, this sport has evolved to various dimensions as a result of innovation and growing interest in sports. This study documents the evolution of cycling from being a mode of transport to recreation to adventure sport, as practised in recent times. With the help of a relevant literature review, this study proposes a cycle park in Bengaluru. Bengaluru has observed a growing craze of cycling as a sport, over the past decade. Statistical data from cycle dealers and manufacturers reveals these growing trends. In support of the decision from the Forest Department of Bengaluru to allow cycling in Turrahalli forest, this paper proposes a cycle park adjacent to peripheral ring road amidst Turrahalli forest. The design aims to serve amateurs, professionals, and cyclists of all ages, giving them a safe and natural environment. With the implementation of such a proposal, the authors hope to encourage cyclists and city dwellers to take up cycling on regular basis, in response to the deteriorating global health.

Keywords: cycling, adventure sport, cycle park, Bengaluru, design proposal,

Introduction

Background

After the first world war and the late 1950s, cycling was ubiquitous on streets and public roads all over the world. Later, cycling was replaced by motor vehicles, and cycling headed towards an all-time low demand (Spinney 2007). However, in the 1970s, the health, environmental and economic benefits of cycling were highlighted by activists, politicians, and later by policymakers, activists, urban planners, and public health experts (Civitas 2013) (Oosterhuis 2016). Early on cycles were advocated as a practical and cheaper alternative for a horse, and for this reason, they were introduced in postal and wire services, police and fire departments, and even in the army. The use of motor vehicles, being an expensive means, was mainly for recreation (for example, touring the countryside and enjoying nature) for the wealthier class. In terms of contributing to urban planning, cycle tourism enhanced rural modernization because it encouraged infrastructural improvements along popular routes and the spread of facilities such as cafes, restaurants, parks, information booths, and repair shops. The image and engineering of cycling were essentially linked to competitive racing, in support of the enthusiasm from spectacles. The challenges of speed, thrill, performance, time, and distance records made it more exciting for the audiences. The first long-distance race was staged in France, in the late 1860s, shortly after the launch of the velocipede. Cycle
racing, on indoor and outdoor tracks, was the first commercialized and media-covered mass spectator sport (Ritchie 1999) (Butler 2019).

Figure 1. "Bicyclists' group on Minerva Terrace, U.S. Army on October 7, 1896

Source: (Ruggiero 2016).

Urban Planning

As our cities are getting more aware, people have started to recognize the benefits of active living, sport, and physical activity. The physical and mental health benefits of living an active life and a healthier lifestyle are not unknown. Although cities across Europe have integrated local plans for active living with a broader planning process, many developing countries, such as India, are still working their way to make the urban planning process holistic (Edwards and Tsouros 2008). Out of the many forms of physical activity that urban planning of the city can offer to its people, this study emphasizes the importance of cycling as a sport. Sports can offer multiple solutions to our cities, such as, generating thrust for more green spaces, social inclusion, better sports facilities, and building more equal societies and, eventually contribute to the goal of making our cities more sustainable and resilient (Olympic Studies Centre 2020). At the end of the 20th century, cities looked upon sport as a catalyst to generate an economy. Only industrialized cities invested in sports infrastructure, intending to create more job opportunities and attract tourism. This did not particularly include the local communities. However, since the last two decades, policymakers and planners have become more sensitive towards locals and have created a new image and new opportunities to justify investments in sports infrastructures (Gratton, Shibli and Coleman 2005).

Contextual Background

In the past, India has hosted many national and international tournaments and games, such as the Asian Games. Bangalore, one of the fastest metropolitan cities in India, hosted the Indian National games in 1997
Bangalore has regularly been a host of International Premier League (IPL) cricket for the past decade. It is evident, that Bangalore’s residents have shown a growing interest in sports. Sports clubs, health centres, gyms, arenas, and stadiums have made a significant contribution to the urban fabric and lifestyles of people.

Cycling

One such popular, most sustainable interest among Bangalore’s residents is cycling. Cycling serves as the cleanest mode of mobility. It is zero dependence on fossil fuels and zero-emission characteristics, which not only makes it affordable but also positively contributes to deteriorating climate. After the IT boom in 2000, there has been an average increase in income levels of the working class in Bangalore. With massive populations migrating from all over the globe, the traditional lifestyles have now become more dynamic. There are more than 20 active cycling groups in Bangalore, out of which at least 5 have more than 3000 members (M. 2020). Especially, after the onset of COVID 19, more people have taken up cycling as a mode of primary physical activity. After the first lockdown of COVID 19, wholesalers of cycle shops reported a 30% hike in their sales, and owners of cycle repair shops reported 20 to 30% increases in their customers (Mounika 2020). In response to this, the comprehensive mobility plan of Bruhat Bengaluru Mahanagar Palika (BBMP), announced the development of 600 kilometres of cycle tracks in the next 10 years around the city (Dev 2021). A report by Dutch social enterprise reports a 50% increase in the use of cycles in Bengaluru. Out of which, rides for recreation exceed the number of rides for commute and daily users (Cycle To Work 2020). From the available data, it can be said that residents of Bengaluru prefer to cycle more for recreation than for work.

**Figure 2. Bike ridership in Bangalore from January 2017 till February 2021**
Design Statement

Cycle manufacturers, newspapers, sports communities, local, national, and international organizations sponsor cycle races to promote the sport and diversify economies. Cycling has transformed from a mode of transportation to sports meeting the aspirations of the different populations (Oosterhuis 2016). To serve such aspiration of Bengaluru citizens, this study proposes of its kind a cycling park in Bengaluru, where enthusiasts of all levels can come and practice and/or learn. The design aims to provide a safe, approachable, affordable, amid nature and an equal atmosphere to all cyclists. This architectural project intends to bring out pure structural efforts without artifice and enhance the selected site. By creating a dialogue between the existing urban fabric and the proposed curved geometry, the design aims to display an example of architectural integrity. The design follows global standards employing reviewing case studies around the world.

Context

Location

Bengaluru, the capital city of Karnataka State, is not only the fastest-growing city in terms of population and area but also is one of the (fourth) largest metropolitan hubs in India. The physical growth of the city occurred in four phases: first, (in 1951 – 61) growth of public sector undertaking creating jobs for millions, second (1960 – 70) growth of industries and state-run businesses, third (the 1980s) dramatic growth of the private sector and fourth (1990s) the offshoot growth from establishing IT industry. Only from 1991 – 2001, the area of Bengaluru expanded 92.1% and the population grew by 37.8% (Varkey 2018) (Puttalingaiah, Irfan and Hanjagi 2020). With this huge number of people migrating to the city, the built environment is largely driven by market interests, not by communities, resulting in a diverse cultural system. The lifestyles of people vary due to the influence of distinctive cultures they bring in, individual’s financial capacities, and the localities they reside in.

Figure 3. Location of Bangalore

Source: Authors.
Climate and Geography

Lying in the Southern part of the Indian sub-continent, Bengaluru hails at 3,113 feet above sea level. The topography makes the climate pleasant throughout the year. However, for the past 5 years, Bengaluru is experiencing summer heats up to 40 degrees Celsius, owing to massive deforestation. Bengaluru enjoys 970 mm rainfall on an average annually (Bengaluru Online 2021). The strategy used for urban planning is orbital development, marked by ring roads. This type of development allows urban centres to decentralize accommodating growth with the addition of each ring road.

Figure 4. Orbital development, marked by ring roads

Source: Authors.

Demographics and Diversity

According to the latest census (2011 – 2021) report, the population growth is consistent with an average of 3.5% annually (Census 2011 2021). The native language of Bengaluru, Kannada, is now spoken by only 38% population, which is the result of mixed culture migration. The population density has also increased by 47% in the past decade (4000 per square kilometre) (World Population Review 2021).

Why are People in Bengaluru Interested in Cycling?

With a dramatic increase in population number and diversity, Bengaluru has found a common sport - cycling, famed by their cycling communities. The
active cyclist groups in Bengaluru conduct cycling trips throughout the year. Nandi Hills ride, Manchanabele dam, Banyan tree ride, Pipeline ride, back to university ride, and Neelamangala ride are some of the popular cycling trails, visited by cyclists on daily basis (Bangalore Cycling Routes 2021).

Figure 5. Map of popular cycling trails

Source: Authors.

The evidence of active groups of cyclists from social media channels and pages is proof that if given better facilities, people will be more than willing to make use of it. During an informal interview, active cyclist reported about their growing interest in cycling is due to the following reasons:

- No formal training is required for beginners
- All members of the family (or community) can participate and cycle together
- The occurrence of long-term injuries and major accidents is relatively less
- The cost of cycling varies based on the level of expertise. Hence, the beginners find it affordable, to begin with.
- One doesn’t need a dedicated playground or space to cycle.

In the past (the 1860s and 1870s), when cyclists were replaced by motor vehicle drivers on the road, many motivated cyclists and/or activists made an effort to revive cycling as a mode of transport. The ‘velocipede mania’ in the
1860s, followed by ‘cycle boom’ or ‘craze’ in the 1890s, in many parts of the
west is a piece of evidence that cycling as a mode of transportation has
degraded and again revived over centuries (Toohey 2010).

Government’s Involvement

In 2014, the Directorate of Urban Land Transport (DULT) promoted the
“cycle day” campaign once a month, to encourage cycling as a mode of
mobility. Community partners and NGOs participated from different
neighbourhoods of Bengaluru to carry this campaign (Government of
Karnataka 2014). In 2006 - 07, the government of Karnataka invested Rs. 200
crores to give away free cycles to children aged above 13. In 2020, DULT
submitted a 34 kilometres cycle lane project to BBMP (now under
construction) on the outer ring road, which would give dedicated lanes for
cyclists (Malagi 2020). Also in 2020, DULT received suggestions of cycling
routes, for development, from 109 active cyclists. DULT further developed
these suggestions and with the help of Urban Local Bodies (ULB) of various
municipalities in Bengaluru. As a result, the “Cycle District” project is now
integrated with the “Bengaluru smart city mission”. Under this project, the
government aims to develop dedicated cycle lanes around the city at various
locations (R. 2020).

Literature Review

“Cycling occupies a somewhat unusual position among sports. It is an old sport,
originating at the moment of the birth of the modern bicycle in the late 1860s; it is
an extraordinarily well-documented sport; it is even a sport about which [much has]
been written through the years – and yet...it is not a sport that has been well
explored from a critical and academic point of view”. - Andrew Ritchie

Standards

The proposed design examines standards and architectural details accepted
and adopted globally. The inspiration of the structure of the cycle park is
adopted from the Olympics Games, the velodrome geometry. The velodrome’s
history dates back to the 19th century when Preston Park, Brighton in England
constructed the first cycle track taking on velodrome structure (Nystrom 2020).
Of course, the tracks did not display tuned 180 degrees and straight ways until
1896, when the Olympics spared the need to construct a consistent velodrome.
Since then, velodromes have been modified in terms of the quality of tracks
and sizes. Various sports companies have constructed velodromes for countries
to host cycling races and/or events.
Evolution of Cycle

In the past, cycling tracks were constructed to serve the safety and convenience of cyclists. However, given cycling as a sport, advanced tracks with scientific knowledge on the physics of cycling are a must to understand. Attempts to promote cycling as a daily sport are initiated by governments across the world. For example, the world’s longest continuous cycle track (20.4 miles) was achieved by the public works authority in Qatar in the middle east (Kaddoura 2020). This sport requires stamina, perseverance, self-reliance, core strength, balance, and bike handling skills and has inspired many people in India as well. As discussed earlier, the history of the cycle dates back to the late 18th century. The below table depicts a brief history of the evolution of the cycle.

Table 1. Evolution of cycle

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1790</td>
<td>Celerifere – was invented by Comte Mede de Sivrac. The features include two equal-sized wheels and a seat, but no steering, brakes, or pedals. The rider glides on the celerifere after gaining speed using their feet.</td>
</tr>
<tr>
<td>1817</td>
<td>Steerable Laufmaschine – also known as the running machine, velocipede, Draisine, and the swift-walker. Following the two-wheeler principle, the wooden steerable Laufmaschine has a steerable front wheel.</td>
</tr>
<tr>
<td>1858</td>
<td>Pedals – The steerable laufmaschine has pedals added to it.</td>
</tr>
<tr>
<td>1863</td>
<td>Boneshaker – Blacksmith Ernest Michaux invents the first commercially successful velocipede in 1863, which is now called the boneshaker. The boneshaker was made of stiff materials and straight angles which made it a “boneshaker” to ride on over common cobblestone roads.</td>
</tr>
<tr>
<td>1866</td>
<td>Penny Farthing – British engineer, James Starley invents the penny-farthing which is commonly known as the high wheeler. The penny-farthing looks pretty silly compared to modern bicycles, and it was pretty difficult to ride. This difficulty limited the popularity of the high wheeler.</td>
</tr>
</tbody>
</table>
1876  Caliper Brakes – English inventors Browett and Harrison patent an early version of the calliper brake.

1879  Bicyclette – After many attempts for lever-driven models, Henry J. Lawson patented the first rear-wheel, chain-driven safety bicycle.

1885  Rover Safety Bicycle – The first model to look like what we now think of as a standard cycle. This model combines a low seat, strong metal for a chain, and two wheels that are similar in size.

1889  The Pedal-Back Brake – These brakes were patented by Daniel-Stover and William Hance, which later become a standard feature on bicycles.

1896  Coaster Brakes – These brakes allow the bike to move forward without requiring the pedals to move and the rider can brake by pedalling backwards. These brakes continue to be popular in some areas to this day.

1898  Pedal-Powered Battery Regenerator – This is a peculiar design in which the pedals spin a generator, which in turn drives a small motor. Known for being the first electric velocipede.

1938  Electric Hub Motor – Thomas M. McDonald files a patent for an electric hub motor. This may be the earliest of its kind for a front-wheel-mounted version. The patent filing details this bicycle aims to allow the bicycle to be operated by only power, with the option of pedals.

1979  Mountain Bike – Californian Joe Breeze is credited for creating the mountain bike. The prototypes for these are developed by many early designers including Joe Breeze, Otis Guy, Gary Fisher, and Craig Mitchell. These are the first tough frames built for downhill racing.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>Cogs – It becomes popular for cogs to be added to the rear gear cluster, increasing the number of speeds from 15 to 18, 21, and 24.</td>
</tr>
<tr>
<td>2002</td>
<td>10-Cog Rear Cluster – Italian bicycle component manufacturer Campagnolo develops a 10-cog rear cluster, allowing for 30-speed bicycles.</td>
</tr>
<tr>
<td>2009</td>
<td>Electronic Gears – International manufacturer Shimano develops electronic gears that allow for faster shifting.</td>
</tr>
<tr>
<td>2012</td>
<td>ADAPTRAC – names after the inventor, a system allowing the rider to individually adjust tire pressure while riding. Through a system of carbon dioxide cartridges, allows riders to maintain optimum traction when riding in changing conditions.</td>
</tr>
<tr>
<td>2014</td>
<td>Lithium Nickel Manganese Cobalt Oxide Batteries – Otherwise known as NMC batteries, this is a newer type of lithium battery that starts becoming popular with electric bicycles around 2013-2014. NMC delivers higher power in a smaller package than previous models.</td>
</tr>
</tbody>
</table>

Source: Adapted from (Evelo Electric Bicycles 2021).

**Types of Cycling**

Cycling as a sport is practised at various difficulty levels. These cycling styles have helped popularizing as a sport, by making it physically and mentally challenging for cyclists.

- BMX – BMX is one of the most popular off-road styles, usually seen and practised in the rural areas or countryside, where the cyclist would naturally get undulated terrain. It originated int1970s70’s in California, where one could find youngsters riding and stunting off-road. Just like motorcycles. BMX cycles are sturdier in make and smaller in dimension. It is made to take abuse and stunts, which would challenge both, the rider and the ride. BMX cycles have frames made of steel (high-tensile) and aluminium, those meant for racing. BMX cycles offer various riding styles, from off-road to urban build-up spaces to ramps designed in BMX parks (P. Edwards 2016).
- Road biking – This is the most commonly performed cycling as it doesn’t need a professional training. These cycles are used on a variety of roads such as BMX, racing, touring, and utility. It can be used in the
velodrome as well as outdoors. The first-ever cycle race (1200 meters) was held on 31st May 1868 at the Parc de Saint-Cloud, Paris, where road biking cycles were extensively used. As India is gradually turning its attention to adventure sports, road biking has become very popular over the past few decades.

**Figure 6. BMX Stunts and Road Biking**

- **Mountain biking** – This is an extreme style, where riders build their pumps and trails. Although there are no formal rules to this style, trained mountain bikers are aware of the unwritten rules, such as, be respectful of jumps and trails and be respectful of others. Weather and terrain play an important role in performing this style and conducting challenges. Dirt jumping, slopestyle, cross country, and downhill are some of the categories popularly performed while mountain biking.
Figure 7. Mountain biking style

Source: Authors.

- Freestyle – The lightest weighing cycles are made to freestyle. They become popular shortly after BMX cycles and are used for flat trails, vertical skates, and aggressive street riding. Considered one of the safest styles, they come with multiple front and back gears.

- Dirt jumper – These bikes bridge the gap between BMX bikes and freestyles. Also known as jumpers, these cycles are designed to take flight for various ages of cyclists. They usually don’t have front brakes and are a great choice for heavier riders.

Case Study 1

Anna Meares Velodrome (10,000m2) was built in 2016 to serve the Commonwealth games 2018 in Brisbane, Australia. The stadium can accommodate 1500 spectators and can expand for 4000 more with temporary seating. Several events throughout the year, such as Track National Championships, Queensland National Championships, and Cycling Queensland Club are hosted at Anna Meares. Cox Rayner from COX Architects was the principal designer, jointly commissioned by Queensland State and the Australian government. With an elliptical footprint, Anna Meares Velodrome is one of the largest column-free arenas in the world. The steel roof makes the structure light weighted and provides a clear roof span of 118 meters. The stadium is water and energy-efficient and uses full LED broadcast lighting, making it one of its kind in the world (Arup 2019) (Austadiums 2021) (Cycling Queensland 2021).
Figure 8. Anna Meares Velodrome

Source: (Jones 2018).

Figure 9. Top view plan and East Elevation of Anna Meares Velodrome

Source: (Archdaily 2021).
Case Study 2

Lee Valley Velopark in East London was inaugurated in February 2011. The velodrome has served as permanent venues for Olympic 2012 and Paralympic games. Along with racing tracks, the velodrome has one mile of road tracks and 5 miles of mountain tracks. The design was publicly revealed by Hopkins Architects and Grant Associates in 2008, making it the first Olympic Park venue. The stadium can accommodate 6000 spectators and provides for all levels of cyclists, amateurs, and champions. The design focused on making it sustainable by adopting technologies like rainwater harvesting, harvesting natural light, and energy saving. The velodrome was a built-in way to make the London skyline beautiful, primarily using the traditional western cedar redwood as construction material. The idea was to avoid massive use of steel, in an attempt to not give a contemporary look (Wordpress 2016) (Hopkins Architects 2021).

Figure 10. Anna Meares Velodrome

Source: (Hopkins Architects 2021).
Figure 11. Upper-tier plan and Sectional elevation of Lee Valley Velopark

Source: (Hopkins Architects 2021).

Table 2. Comparative table of case study findings

<table>
<thead>
<tr>
<th>Features</th>
<th>Anna Meares Velodrome, Australia</th>
<th>Lee Valley Velopark, London</th>
<th>Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area of Velodrome</td>
<td>10,000 m²</td>
<td>21,700 m²</td>
<td>11,450 m²</td>
</tr>
<tr>
<td>Capacity</td>
<td>1500 (44000)</td>
<td>6750</td>
<td>2000</td>
</tr>
<tr>
<td>Building Type</td>
<td>Indoor</td>
<td>Indoor</td>
<td>Indoor</td>
</tr>
<tr>
<td>Primary Material used</td>
<td>Concrete and Steel</td>
<td>Wood (western cedar redwood)</td>
<td>Concrete and Steel</td>
</tr>
<tr>
<td>Clear Roof Span</td>
<td>118 meters</td>
<td>136 m</td>
<td>125 meters</td>
</tr>
<tr>
<td>Sub-structure</td>
<td>Concrete</td>
<td>Concrete</td>
<td>Concrete</td>
</tr>
<tr>
<td>Super Structure</td>
<td>Steel</td>
<td>Steel</td>
<td>Concrete and Steel</td>
</tr>
<tr>
<td>The material used for tracks</td>
<td>Steel and wood</td>
<td>Steel and wood</td>
<td>Steel and Wood</td>
</tr>
<tr>
<td>The total length of the track</td>
<td>250 meters</td>
<td>250 meters</td>
<td>250 meters</td>
</tr>
<tr>
<td>180 turning radius</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>Roof framing is configured to allow the complex hyperbolic paraboloid roof to be formed by simple straight components.</td>
<td>The roof is designed to reflect the geometry of cycling as well as being lightweight and efficient reflecting a bike. There is also a 360-degree concourse level with</td>
<td>The truss form which connects to the multiple steel support will gain better stability and the orientation has designed on a contoured site.</td>
</tr>
</tbody>
</table>
windows allowing people views of the Olympic Park.

|--------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------|

Source: Authors.

Methodology

The motivation of designing was initiated by the author’s interest in the cycle as a sport. When researched further in Bengaluru’s context, the vision was set to serve a rather larger community. In this regard, understanding the context became the first step of the overall design process. A thorough desktop study was carried out to understand the climate, geography, demography, and culture of Bengaluru. Support from municipal authorities confirmed the need for such a project and led to an appropriate site selection. Secondly, the literature review was conducted to identify scientific standards which would make the rider’s experience safe. Case studies from over the globe guided in implementing these standards into the design. The third step, which was analyzing the physical and geographical conditions of the site, resulted in defining the limitations of structural design. With sustainable architecture as the core theme, a conceptual design was then developed disturbing as little as possible, the existing greens. The final design phase included details of architectural and structural design. The final design of this study is presented in the form of architectural plans, sections, and three-dimensional views.

Figure 12. Design Process

Source: Authors.
Design (Findings)

Site Selection

From figure 5, it can be inferred that many existing popular trails in Bengaluru are located adjacent to the new ring road, Nice road, soon to become a peripheral road. The design aims to serve all ages and all professional levels of cyclists. Hence, it is reasonable to choose a naturally levelled landscape between nature to give the cyclists a real experience. The selected site is located adjacent to Nice road, marked for “park or open space” by Bengaluru Land use development authority. Lying adjacent to the ring road, not only makes the site accessible but also makes the cyclist near to nature as it is surrounded by Turahalli forest’s deciduous trees. The Turahalli forest department currently allows enthusiasts and cyclists to practice and ride, which makes it rational to develop a cycle park there. As the site is adjacent to ring road and the nearest bus stop is 500 meters away, it can be easily accessible by road.

Figure 13. Site location on Bengaluru map

Source: Authors.
The design is developed along the contours of the site, which assists to give natural tracks to BMX and mountain bikers. The maximum and minimum elevation of the contours on the site is 12 - 14 meters with a total site area of 19.07 acres (77,180 square meters). The area surrounding the site is still under development and the only built fabric found are small tea shops, grocery shops, auto garage–repair shops, and bus stops. As the area is allotted to Forest Department, which is responsible to conserve the forest as a natural resource, constructing permanent buildings and high rise is not a scope even in the future. The proposed design utilizes all the existing trees, as a response to forest conservation.
Figure 15. Proposed site

The Setting of Geometry

The setting of the site and its building structure is inspired by the tension nodes of a cycle. During the ride, the weight applied on the saddle, the cycle frame transfers the tension on the nodal points. The connection of those frames acts as a medium to circulate tension on all nodal points. However, based on the weight on the saddle and the pressure on the peddles, the tension at different nodal points differs from time to time. In the proposed design, these nodal points (the shape derived from a cycle to site) act as primary spaces, in terms of their function. Refer to Figure 20.

Figure 16. Concept inspired by tension nodes in a cycle
The Setting of the Site

The main structure, that is the velodrome occupies the Northwest side of the site, which is adjacent to the peripheral road too. If the structure of the cycle frame is superimposed on the site, the location of the velodrome represents a major nodal point (tension point below the saddle). Laying the site from its northernmost edge, the indoor and outdoor mountain biking (MTB) park represents the topmost nodal point in the cycle frame (the handle of the cycle). The central part of the site comprises BMX park and kids pump park. When implemented, this cycle park can serve as an athletic sports centre that can host national events. Housing is provided on the eastern edge as a response to such future events. On the opposite end of housing lies the velodrome with a capacity of 2000 people, adjacent to an outdoor amphitheatre and administration block. In the rear end of the site, the southern side lies the parking for visitors and cyclists. With a clear roof span of 125 meters in the velodrome, the structure is entirely constructed out of concrete and steel. The tracks are made out of wood and steel. The truss which connects to the multiple steel support is designed to gain better stability and orientation on a contoured site.

**Figure 17. Site plan development**

Source: Authors.
Figure 18. Site sections

Figure 19 shows (1) vehicular access to the site, which aims to keep the inside of the parked vehicle free; (2) pedestrian and cyclist access and (3) service access. The service access will be used in case of events.

Figure 19. Vehicular access; pedestrian and cyclist access and service access

Source: Authors.

Design Details

The design of the velodrome is structured into steel and concrete frames supporting a column-free track. Above the ground level (2.5 meters), at 3.5 to
7.5 meters accommodates the gym, cycle associations, and other services. The entry-level consists of entry/exit points along with a few shops and utilities. The seating capacity accommodates 2000 people from 8 meters and 11.5 meters. The wooden Velo track is supported by metal sections forming the outer shell and support for the velodrome. This is enveloped in glass with minimal openings, with the idea to use natural light to its fullest. Even the tubular truss, which forms a light roofing structure is combined with metal tubes letting natural light in. Figure 20 shows details of the velodrome and its sectional details.

**Figure 20. Design of velodrome and sectional details**

*Source: Authors.*
**Figure 21. Elevational view**

Source: Authors.

**Figure 22. Velodrome top section**

Source: Authors.

**Figure 23. BMX track for kids and professionals**

Source: Authors.
Conclusions

The study included a literature review exploring people’s growing interest in cycling, especially during pandemic times (COVID 19). The influence of the mixed culture population and immigrants from all over the country and globe has given new light to the potential of cycling as a sport in Bengaluru, in the recent decade. Several cyclist groups have explored cycling trails in and around Bengaluru. However, many cyclists still do not get a chance to practice stunts due to no dedicated infrastructure. The amateurs also lose motivation due to the little infrastructure provided and for safety reasons. With this notion as a starting point, this study has documented international standards and case studies, to propose a cycle park for amateurs and professionals where they can practice cycling as a leisure activity as well as a sport. The idea is to give the infrastructure of an international cycling stadium within the city limits but also with natural textures, such as uneven terrain which is needed for mountain biking. The design provides BMX track cycling, road biking, mountain biking, freestyle and dirt jumper facilities. Concepts such as natural lighting, water and energy-efficient systems make the design relevant to the time. If implemented, this study aims to provide the place with appropriate infrastructure for all cyclists and for national and international cycling events to take place.
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