POKHARA
RESEARCH CENTRE

STRATEGIC APPROACH TO SOLVE
PARKING PROBLEM
IN POKHARA

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Published by: Pokhara Research Centre

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This paper was done under the guidance of Sujan Regmi, Executive Director, Pokhara Research Centre (PRC)

Supported by: Samriddhi Foundation

Published by
Pokhara Research Centre
Newroad Pokhara, Gandaki Province, Nepal

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ACKNOWLEDGEMENTS

First and foremost we owe our deepest gratitude to our supervisor Mr. Sujan Regmi who gave us the freedom to explore and experiment different methods and ideas to sharpen our points on this research paper. We are grateful to Mr. Bipin Chhetri, Parking manager of Midtown galleria for providing his valuable insight based upon his experience. We would also like to thank Mr. Santosh Roka from District Traffic Office, Kaski for his support.

We would like to thanks our colleagues Ms. Monika Ranabhat, Ms. Sujata Dhakal, Mr. Saurab Wagle and Mr. Nishan Shrestha for their timely support. We would also like to thanks all the respondents of our research for sharing valuable information.

LIST OF ACRONYMS AND ABBREVIATIONS

PMC	Pokhara Metropolitan City
KMC	Kathmandu Metropolitan City
DTPO	District Traffic Police Office
TDM	Transport Demand Management
UCLA	University of California, Los Angles

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ABSTRACT

With a current rising number of vehicles running in Pokhara Metropolitan city, in half span of decade if nothing is done in order to manage space for these vehicles then a huge parking crisis is to happen. We are already witnessing this wave, yet it is not at its peak. For instance, looking at the current parking scenario at New Road, it takes a minimum of 2 minutes to find an on-street parking spot on a normal day. On a busy day this time crosses 5 minutes which is a big concern, therefore we have to treat this problem very seriously. It is not just time consuming but also a very big cause of road accidents and failed transportation system.

This paper focuses all the aspect of parking problem faced by PMC at the moment and come up with new and innovative ideas to solve this issue.

Contents

1. INTRODUCTION

Pokhara Municipality was established in 2016 B.S.(1960 A.D.), finally transformed into Pokhara Metropolitan City (PMC) in 2075 B.S. with 33 wards having an area of 464.24 Km^2. According to CBS data of 2011 A.D., the total population of PMC is 4,13,397. Pokhara serves as the capital of Gandaki province. It is the country's largest metropolitan city in terms of area and second largest in terms of populations. The city also serves as the headquarters of Kaski District. Serving as the capital of Gandaki province, Pokhara is being crowded day by day. Pokhara is also a major tourist attraction for both international and domestic tourists and is frequently visited by tourists for sightseeing and many other adventurous sports. Pokhara has been used beyond its capacity and is now facing the problems of congestion, traffic and parking. About 190,000 vehicles play on the roads of Pokhara daily. This number is increasing daily (DTPO, Kaski). As traffic congestion increased, so did the problem of parking. According to Ministry of Physical development and Transport management, Department of Transport Management 2072/73 data, a total 13,757 vehicles were registered in Gandaki province.

Almost every district of Gandaki province or overall Nepal is connected with the city Pokhara. According to the

Strategic Road Network of Nepal, the total length of Kaski district is 2084.4 km^2. Population of Pokhara is increasing gradually, so is the issue of traffic congestion and parking. The migration toward the city in search of better opportunities has increased Population density of PMC along with the number of two and four wheelers. Basically, parking is a problem of space, with the increase in number of vehicles running in the roads, the demand for parking spaces has outgrown its availability. This is especially because the infra-structural growth of our city is unable to go in hand with the growing demand for parking spaces. Due to lack of sufficient parking space, parking is the top most issue that Pokhara is facing.

2. OBJECTIVES

The objective of this research project is to analyze the current parking scenario in Pokhara Metropolitan City (PMC) and come up with useful and innovative solutions for the existing issues.

This paper will study the problem of parking in different angle and perspectives. Parking will be studied as a variable that creates costs and also as a tool for traffic demand management. It will be looked at in relation to land use, public transportation, and traffic congestion. Parking shortage within the central business areas of the city will be viewed as a case in point to the promotion of public transit. The current parking practices in Pokhara will be studied in order to identify the existing flaws and opportunities for improvement. It will also include recommendations made to stress the importance of this approach to parking when new plans and policies are made.

3. METHOD OF DATA COLLECTION

1. Secondary data were collected from government websites
2. Direct on field observation was done to assess the parking problems
3. Interview with local and government officials were conducted
4. To conduct this research efficiently there were many references taken from international best practices.

4. RESEARCH SETTING

Considering the wide area of PMC, we narrowed down the research into several main areas for on-street and off-street parking. On-street Parking includes Lakeside, Hallan Chowk region.

Hallanchowk is the centre of lakeside which is the main tourist hub of Pokhara. All the big restaurant, bars, spas and hotels reside in this region. Travelers across the world come here to enjoy the beauty of magnificent Fewa Lake and plan their journey of rafting, hiking, paragliding, mountain climbing and other adventure.

Currently most of the parking in PMC is done on-street which is based on contract. Off street parking includes all the big shopping malls of PMC like Bhat bhateni, Bishal Bazar, and Midtown galleria. Proper field visit, interview, and observation was made to form any conclusion.

5. PARKING VIOLATION

Around, 1 lakh 90 thousand vehicles operate each day and the number is increasing on daily basis. PMC has been collecting good amount of revenue from un-authorized parking. As of FY 2074/75 more than 43251 were punished for unauthorized parking, from which rupees three crore thirty lakh thirteen thousand and five hundred amount of fine and penalties were collected.

766 vehicles were wrongly parked and fined 7lakh and 66 thousand ,731 vehicles were chain-locked from which 7 lakh 31 thousand were collected as fines.

In the month of jestha 2075, two hundred eighty-two vehicles were punished from which total revenue of 2 lakh 89 thousand and 5 hundred was collected as fine.

Table 1 : Vehicle punished on No parking Area.

S. N	2074/75	No. of Action Taken	Fine Revenue
1	Vehicle punished	766	766000
2	Chain-locked	731	731000
	Total	1497	1497000

(Source: District Traffic Police Office, Kaski)

6. EXTERNALITIES OF PARKING PROBLEMS

One of the biggest problem parking issue have is upon our public transportation system, due to high traffic congestion which result from extra time required to search for parking spot by private vehicle.

PMC bus stops are slowly turning into parking spots, workers of various private organizations have been using these bus stops to park their private vehicles for whole day.

Due to lack of parking space at the bus stops, drivers of public vehicles have started stopping their vehicles in the middle of the road to load and unload passengers. This wrong practice has led passengers to stop bus where ever they want which is a big concern. People who park their vehicles in unauthorized manner are fined ranging from Rs 500 to Rs 1,500. Targeting offenders, the traffic police have also put-up restriction and stop signs at the bus stops.

However, all these measures does not seem to work efficiently, that's why Pokhara Research Centre with this research paper is trying to give more clarity and understanding of the problem which will eventually empower us to come up with better solution which would be discussed further in this paper.

7. WHY DO PARKING SPACES NEED TO BE PRICED ?

Donald Shoup, a research professor of urban planning at UCLA, and a Georgist economist states, "Providing anything for free or at highly subsidized rates encourages overuse and means that more parking spaces have to be provided. Therefore, charging users for parking is a market-based approach that passes the true cost of parking to users and encourages use of other transportation modes".

The failure to charge a price for parking results in the misallocation of costs which leads to the distortion of the market. In other words, free parking results in market failure. The reason for this is that 'free' parking is in fact quite costly. Parking imposes various costs on the entire transport system as it takes up space and adds to traffic congestion. Hence, providing free or cheap parking represents a case of market distortion where the one who creates the cost is not held directly accountable. Pricing the user directly for using parking helps to avoid these distortions and also to mitigate the costs. One of the main reasons for pricing any good or service is the generation of revenue. Similarly, parking too has the capacity to generate revenue if priced correctly. This revenue should be channeled to the maintenance of the parking systems. If parking is regulated and priced as per market requirements throughout the city, we can expect to generate far greater revenue.

However, the fee set for these spaces is very low and is negligible in comparison to the other costs of driving, vehicle maintenance costs and fuel; which plays a major role in deciding whether or not to drive. This may be the reason why parking has not entered into the average driver's consumption function as a variable. These prices must not be viewed as an attack on the driving public but as a compensation to provide them with better parking facilities and a subsequent improvement in the transport scenario. Charging a price for a service also holds the provider more accountable, ensuring better service.

Also, in order to make parking a responsible act in the society, it must be charged reasonably according to market forces i.e., demand and supply. If charged reasonably with consideration of population density of that area, it will force the key stakeholders like businesses to park their vehicle somewhere else and leave their on-street parking area for customers which will have a positive externality in terms of business in that region.

The cost of provisioning a good in the market is often used as a reference point while setting its price. Cost based pricing involves adding a fixed sum or percentage of the cost of production to the total cost to come up with the price. But what is the cost of a parking space? The costs that are incurred during provisioning space for parking are costs of land, cost of the facility – whether it is building an off-street parking complex or installing parking meters on the streets, maintenance costs and other social and environmental costs.

Land use patterns have diverse economic, environmental and

social impacts. For instance, some land use patterns may be more favorable to people with cars and others maybe more convenient to those using public transit. Transportation and land use are closely connected. The first obvious connection is that land is used for transportation and any land use plan will involve demarcating land for transportation purposes –roads, parking lots. The second, indirect connection lies in the effect of the composition of transport on land use. The increase in private modes will lead to a spread out or dispersed land use pattern while the increase in usage of public transport will lead to a more compact, infill development. In order to justify using land for parking as opposed to using it for housing or development, the price must be set to reflect the opportunity costs of the land in question.

Pricing is often used as a tool to offset excess demand. With regard to parking too, pricing can be used to control the demand for parking spaces. This is a method of transportation demand management. Different prices can be set according to the availability and convenience of the space. These prices will serve as a financial disincentive for parking and discourage long term parking in prime locations.

8. DIFFERENT TYPES OF PARKING

Before understanding the current parking practices in PMC, it is essential for us to understand different types of parking:

8.1. Parallel Parking

Parallel parking is a method of parking a vehicle parallel to the road, in line with other parked vehicles. Parallel parking usually requires initially driving slightly past the parking space, parallel to the parked vehicle in front of that space, keeping a safe distance, and then followed by reversing into that space. Subsequent position adjustment may require the use of forward and reverse gears.

Parallel parking is considered to be one of the hardest skills for new drivers to learn and is a required part of most driving tests. Parallel parking enables the driver to park a vehicle in a smaller space than would be true of forward parking. Driving forward into a parking space on the side of a road is typically not possible unless two or more successive parking spaces are empty. Reversing into the spot via the parallel parking technique allows one to take advantage of a single empty space not much longer than the car.

8.2 Perpendicular Parking

Vehicles are parked alongside each other, perpendicular to the curb or a wall. This kind of parking can be seen in front of some shops and buildings that provide enough space for it.

8.3 Angular Parking

Cars are parked alongside as in perpendicular parking but at an angle – normally of 60 degrees to the curb. Angular parking is most common in a parking lot because it takes up total space and is easier to access. It can also be used on streets where space is adequate.

8.4 Back-In Parking

For back-in parking, vehicles preparing to enter a parking space drive slightly past the space signal, and then back into the space. When leaving the space, drivers have an unobstructed view of traffic and can enter the traffic stream directly. In comparison, drivers using traditional pull-in angle parking often have difficulty seeing other traffic as they back out of the space, resulting in traffic delays and considerable risk of collisions with pedestrians, bicyclists, and vehicles. The vehicle positioning associated with back-in angle parking allows eye contact and verbal or non-verbal communication between exiting drivers and other road users. Back-in angle parking positions the back of the vehicle next to the sidewalk/footway, enabling easier loading and unloading of the trunk/boot. It also po-

sitions the driver and passengers (including children) to enter and exit the vehicle towards the sidewalk instead of stepping toward traffic.

The primary disadvantage of back-in angle parking is that some drivers find the backing maneuver awkward, particularly if they have limited backing experience or the vehicle has poor rearward visibility. This can be overcome by intelligent use of side mirrors and reversing cameras, though blind spots can remain. Another criticism is that exhaust emissions may annoy pedestrians and residents nearby. Inexperienced drivers may take a wider clearance from an adjacent vehicle, resulting in less efficient use of available space.

Also, when backing into a relatively enclosed area (e.g., a solid wall or stall), unseen pedestrians may more easily be injured, since visibility behind the vehicle is more limited.

8.5 Overspill Parking

Overspill parking is the parking of vehicles beyond a defined area specifically designed for this purpose. It can occur because provided parking spaces are insufficient for demand or considered unsatisfactory, and may have unintended consequences on its surroundings. Concept of overspill parking has been used by people of Pokhara desperately searching for parking space. Additional official parking may be provided for an event, or at some distance from the intended destination. The competent authority shall, in consultation with the officials of local bodies at the village, municipal and district levels, determine park-

ing places, without causing adverse effects on traffic on the main roads. A motor vehicle must not be parked in a public place in such a manner as to cause danger, obstruction or inconvenience to any other motor vehicle or person. Parking space should be in a location that is designated for parking, either paved or unpaved. It can be in a parking garage, in a parking lot or on a city street. The space may be delineated by road surface markings. The automobile fits inside the space, either by parallel parking, perpendicular parking or angled parking. Depending on the location of the parking space, the time allowed to park may be fixed by regulation, and a fee may be required to use the parking space. It may be designated for free parking. When the demand for spaces outstrips supply vehicles may overspill park onto the sidewalk, grass verges and other places which were not designed for the purpose.

9. CURRENT PARKING SCENARIO

9.1. On-Street Parking

From the above parking violation data and the negative externality of parking upon public transportation it is clear that the current on-street parking is not very efficient at managing parking in PMC.

Pokhara Metropolitan has been frequently changing its parking techniques. Double parking on the road was practiced at the beginning to overcome insufficient parking space. Later it was believed that it congested the road and the number of accidents was increased because of double parking. Metropolitan came-up with angular parking. It worked for some time, and again it was changed to parallel parking.

Phewa Savitri JV is a joint company which is given the parking contract in PMC for the next 2 years which costed them 3 crores 16 lakhs. Their contract will end in December 13, 2022. The rate at which these companies charge for parking is as follows:

Table2: Fee of Parking Specified by Pokhara Metropolitan City

S. N	Location	Mini & Micro Bus Per hr. (in NRs.)	Car, Jeep & Van Per hr. (in NRs.)	Motercycle & Scooter Per day (in NRs.)
1.	Seti river bridge- Prithiwi Chowk- Srijana Chowk- Zero K.M. Road	30	20	10
2.	Prithiwi Chowk- Nayabazar- Mahendrapool- Palikhe Chowk road	30	20	10
3.	Sabhagriha chowk- B.P. chowk- Newroad	30	20	10
4.	Mahendrapool- B.P. chowk- Siddartha chowk road	30	20	10
5.	Lakeside Khahare- Hallan-chowk- Barahi chowk- Sahid chowk road	30	20	10

Source: District Traffic Police Office, Kaski

9.2 Off-Street Parking

There are several off street private parking venues own by hotels, restaurant and shopping malls but there are very few public off-street parking zones. every off-street parking lot have their own price and time set for parking which is handled by a paid security person.

For the simplicity of our research we have narrowed down and compiled the most important off street parking zone of PMC.

1. Bhat Bhateni Super Market

In Bhat Bhateni off-street parking is free up to 2 hrs which is only applicable to Bhat bhateni customers however there is a certain level of free ride enjoyed by outsiders.
Non Bhat Bhateni customers also exploit the free service up to 2 hrs.
If the time limit of 2 hours is exceeded then the customer or the outsider have to pay 100 NPR per hours which is way too much compared to on-street price.
The penalty is same for two wheelers as well as four wheelers. There are separate allocated compartments for staffs parking.
The underground parking is not managed full time by any security person at the moment due to covid impact upon customer size. Therefore parking time is determined by security cameras in the basement.
However there are 4 men in-charge of security and parking at the moment in the ground floor which is mostly packed.

2. Midtown Galleria

Midtown galleria charges 10 NPR per hour for 4 wheelers and 5 NPR per hour for 2 wheelers. The rate set by Midtown is cheap for cars but expensive for 2 wheelers compared to price on-street. Their parking is mostly occupied by the staff of Midtown said the manager Mr. Bipin Chhetri. The underground parking area of Mid Town is much smaller compared to Bhat Bhateni.

3. Bishal Bazaar

In the busy area of New Road Bishal Bazar provides its own parking facility which includes only 2 wheelers. Charges are 10 NPR per day and the parking area is very smaller compared to Bhat Bhateni and Midtown.

Bishal Bazar does not accept the parking ticket issued by Phewa Savitri.

10. CURRENT POLICY RESPONSE

In order to tackle increasing parking demand, PMC have given Phewa Savitri JV parking contract for the next 2 years which costed them 3 crores 16 lakhs. Their contract will end in December 13, 2022.

PMC has also given a 50% tax concession while approving house map, if the house has underground parking. Buildings with underground parking will really help in parking management and helps to avoid overspill parking.

PMC has different fees for parking according to the places. Places having high population density have parking fees Rs.30/per hour for mini-bus, Rs. 20/ per hour for taxis, cars and Rs. 10 for bikes and scooters per day. The parking lots, bus-stop, parking prohibited areas and zebra crossings will be as specified by Pokhara Metropolitan City office and District Traffic Police Office, Kaski. Those institutional vehicles i.e. mini-bus or micro-bus registered in gandaki Province have to pay Rs.1500 per month and taxis have to pay Rs.1000 per month.

11. CASE STUDY OF HALLANCHOWK ON-STREET PARKING

Hallanchowk is the centre of lakeside which is the main tourist hub of Pokhara. All the big restaurant, bars, spas and hotels reside in this area. Travelers across the world come here to enjoy the beauty of magnificent Fewa Lake and plan their journey of rafting, hiking, paragliding, mountain climbing and other adventure.

Peak parking time at hallanchowk area is during Saturday or during festival season like holi and new-year. During Saturday mostly 9-11am and 7-8 pm is the time when there is high competition for parking space. Subash B.K a 22 year old is in-charge of parking of this area along with his senior Ram Pariyar,37 who has 6 years of experience in this field.

The ongoing parking price needs to be revised since the opportunity cost of parking is very high, which is neglected while calculating the parking prices.

A normal car requires a space of at least 20 square meters to park, the same space costs around NPR 31000 per month if rented in Hallanchowk. This means per day rent would be approximately 1000, if we assume the parking spot to be utilized 12 hours a day then per hour parking cost would amount to around NPR 85 per hour for car.

Therefore, the current price of NPR 20 an hour is way too small as compared to the opportunity cost of parking. In order to satisfy the opportunity cost either parking prices or monthly rent have to be adjusted in Hallanchowk.

12. PARKING PRACTICE OF SOME CITIES

Urban parking spaces can have a high value where the price of land is high. In Boston in 2009 a single parking space sold for $300,000. According to Parkopedia's 2017 Global Parking Index, the cost for 2 hours of parking in USD$ for the top 10 cities is as follows:

Table3: Cost of Parking in top 10 cities

Country	City	Price
United States	New York	$32.97
Australia	Sydney	$28.45
Australia	Brisbane	$21.77
Australia	Melbourne	$21.56
United States	Boston	$20.80
United States	Chicago	$18.66
United Kingdom	London	$16.26
Japan	Tokyo	$15.16
United States	San Francisco	$14.85
United States	Washington DC	$14.28

Source: Wikipedia

Compared to PMC parking price in these countries are very high which is obvious when we look at their GDP per capita. Therefore PMC should consider GDP per capita while deciding parking price which makes the parking cost more reasonable.

12.1 Tokyo

Nokisaki, a startup in Tokyo, Japan is solving Japan's parking and retail space problem by connecting commercial landlords to small merchants looking for a small space. This startup is also trying to solve japans horrible parking problem, currently they have 4000 parking lot listed at their website and number of registered users are more than 130000 as of 2017.

In Tokyo, the most popular parking lots are those with coin-operated parking meters. The problem is you don't know whether you can park your car until you get there. You don't know whether there's an available slot. You have to spend 30 minutes or an hour to find a vacant space. Nokisaki is solving such a problem by allowing people to book a parking lot before they arrive. They can book via their website and they can use it per day.

12.2 Bengaluru

Bengaluru has come up with a digital solution to solve its parking problems.

A three-year-old start-up, Get My Parking (GMP), acquired another start-up in the parking solutions domain called Constapark to provide solutions which will digitize the whole parking process.

The solution involves multiple parking spaces set up at a particular location. Here, motorists subscribing to this app will be helped to get parking, either by reading an installed radio-frequency identification (RFID) chip, near-field communication

(NFC), or a quick response (QR) code sent to the user.

It helps motorists find the nearest available car park and it enables ticketless, automated access and cashless and a transparent billing system. Some pilot projects are already launched within private commercial complexes to assess the feasibility of this project. They already manages 30,000 parking spots on its platform and parks 4,000 vehicles on a daily basis across Bengaluru.

12.3 Kathmandu

Kathmandu metropolitan city (KMC) in collaboration with a private company, Wheels Truly Yours, had launched smart parking in New Road where anyone could book a parking space using the mobile app Park KTM with an android phone.
Parking charges have been set at Rs 15 for two-wheelers for up to 30 minutes and Rs 25 for an hour. As per four-wheelers, the new parking charges have been set at Rs 50 for 30 minutes and Rs 80 for an hour.

Local business people had shifted their parking lot to the inner areas of New Road and Mahaboudha to avoid having to pay such a huge amount for parking. To help local business people, KMC has announced free parking lots for business owners in new road. This is a great example PMC can take from KMC.

13. MOST EFFECTIVE SOLUTION FOR PARKING AT PMC

Population density of Pokhara is increasing day by day. After completion of Pokhara International Airport the population density of Pokhara is going to increase even more. It's time for concerned authorities to plan proper parking policies. Here are some action plans thought out by PRC team based on different approaches.

13.1 Government Approach

- Increase number of off-street Parking lot:

  It is absolutely necessary for PMC to increase the number of off-street parking venues. Gaining more on-street parking area is not a healthy solution in the long run, all this will cause is more traffic congestion, accidents, pollution and hours of time wasted on the road. Therefore PMC should focus on building more off-street parking venues which the business owners and their staff can use for full day parking and leave the on-street parking spot for the city dwellers and customers.

- Strict regulation at Bus stops

  Strict action should be taken if private vehicle is parked near a public bus stop. Bus stop should only be used for parking public bus for the given assigned time by the

transport department. Stoping public bus on the middle of the road should be illegal hence public bus should only stop at a bus stop. This will ensure and make PMC transportation faster and efficient. This will slowly discourage drivers of public vehicles to stop their vehicles in the middle of the road to load and unload passengers.

- Efficient parking pricing:

  One very important thing PMC should consider is to price efficiently for parking which means to price higher for on-street parking and cheaper for off-street parking. Because higher the price higher will be the incentive of Long time parkers who are mostly business owner and staffs to not Park on-street therefore this will leave the space free for the short time parkers which are mostly customers and travelers. This will incentivize business owners and staffs to park at off-street venues.

- Transport Demand Management (TDM)

  Transportation demand management (TDM) has become a hot topic in recent years. This is thanks in large part to the many ways in which technology has made using and promoting smart transportation choices easier. From a conceptual standpoint, TDM is concerned with the ways in which people make optimal use of locally available transportation resources, with a strong focus on getting people out of single-occupancy vehicles and into more efficient modes of commuting. TDM aims to provide information, incentives, resources, and support to people who

want to make the best possible use of available transportation options. These alternatives include public transit, carpooling, van-pooling, ride-sharing, walking, and cycling.

TDM helps to manage and allocate the price for the most convenient parking spaces to favor priority users. Charge higher rates and use shorter pricing periods at more convenient parking spaces (such as on-street spaces, and parking near building entrances) to increase turnover and favor higher-priority uses. For the most convenient spaces use a progressive price structure to favor short-term users.

For example, charge 10 for the first hour, 15 for the second hour, and 20 for each subsequent hour. Improve Pricing Methods to make Parking Pricing more cost effective, convenient and fair. For example, use electronic pricing systems that accommodate various payment methods and rates, and allow motorists to pay for just the amount of time they will be parked. In case of short-term parking charge by minute rather than by hour and for long-term parking charge by hour rather than by day or monthly payment.

Parking prices can be set to achieve transportation and parking management objectives:

- Price the most convenient parking spaces for customers and clients, with minute or hourly rates.
- Use time variable rates (higher prices during peak peri-

ods and lower prices at off-peak times).

- Price less convenient parking spaces for employees and residents, with weekly or monthly rates.
- Use Parking Pricing to encourage mode shifting. Integrate Parking Pricing with other TDM strategies that support transportation alternatives.(TDM,Encyclopedia,2019)

13.2 Community approach

- Concept of Carpool

  Carpool also called carpooling is an arrangement among a group of automobile owners by which each owner in turn drives the others or their children to and from a designated place. Concept of carpool might work in the case of Pokhara between the co-workers of the offices, hospitals, banks, etc. Carpooling will help to limit carbon emissions. Fewer vehicles on the road mean that there is less exhaust being produced. Carbon emissions from vehicles are a major contributor to greenhouse gases that could be affecting environmental patterns. Many people who work together don't realize that they live near each other. By starting a carpooling group, many new friendships can be formed so that there is a social outlet for people outside of work. Sometimes it can be nice to share complaints or frustrations about work outside of the professional environment and carpooling provides that opportunity in a safe environment.

- Community Parking garage or Parking House

  Concept of a parking garage will be very effective in Pokhara as the number of private vehicles is increasing. Parking garage is a building designed for parking and where there are a number of floors or levels on which parking takes place. Banks, Offices and shopping centers require at least a parking garage, which will be fruitful for all the staff to park at the first which will help in easy vehicle parking and taking out. Community Parking garage is a place built for parking purposes only. Underground parking and parking house might be the best solutions for Pokhara city as its growing population. Parking house is simply a house made for parking vehicle purposes. Alternatively using schools and colleges parking, Hotels parking during long holidays and weekends and festivals can be a new approach to the parking problem.

13.3 Technological approach

- Automatic parking system:

  Automatic Parking system(APS) is a mechanical system designed to minimize the area and/or volume required for parking vehicles. Basically, APS will be effective for cars. We can park more cars in less areas. Slowly the concept of APS, is being popular in the world of Parking. There is no need for driving while looking for an available space. Emissions are greatly brought down and reduced. There

are less chances for vehicle vandalism. There is a minimal staff requirement if it is used by known parkers.

- Semi-Automatic Parking system

  In a Semi-automatic parking system, parking of vehicles depends on the size of the vehicle. A sensor at the gate will calculate the size of the vehicle, according to the size of the vehicle there will be parking space where the vehicle can be parked.

- Concept of Solar Parking meter

  Solar Parking Meter is a recently popular tool in the parking world. Solar parking meter is a fully automatic system, which has a self-payment system. It can work on low lights, heavy snow and can survive extremely cold temperatures. This concept doesn't require human resources and is environmentally friendly.

  public vehicles must be improved and the public should be aware about the benefits of usage of parking.

- Smart parking lot:

  According to research conducted in France, a person spends almost four years in their lifetime while looking for a parking space. Efficient parking systems will help in minimizing search time and reduce vehicular emissions. Sensors are used in parking areas to monitor parking capacity and availability of spaces and increase fee revenue and create jobs. This information is transmitted electronically to a central platform that evaluates the data and

communicates with the customers.

- Concept of parking card system:

  Concept of a parking card must come up for better management of parking facilities. PMC must start a parking card system that will generate monthly/yearly revenue from parking directly from the vehicle operators.

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