

नेपाल Nepal

वर्ष ५० अङ्क ६ पूर्णाङ्क २३३ जेठ/असार, २०७८

इन्जिनियरिङ विशेषाङ्क



सूचना तथा प्रसारण विभाग

नेपाल
द्वैमासिक

Nepal
Bi-Monthly

वर्ष ५०

अङ्क ६

पूर्णङ्क २३३

जेठ/असार २०७८

प्रधान सम्पादक
गोगन बहादुर हमाल

सम्पादक मण्डल
भरत गौतम
सुमन बज्राचार्य
लक्ष्मी दुरा
प्रवीण श्रेष्ठ
वसन्त बहादुर खत्री
केशव राज शर्मा

भाषा सम्पादन
डा. विजयप्रसाद मिश्र

आवरण/लेआउट डिजाइन
सुवास राई

मुद्रण
मुद्रण विभाग

प्रकाशक
नेपाल सरकार
सञ्चार तथा सूचना प्रविधि मन्त्रालय
सूचना तथा प्रसारण विभाग
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नेपाल द्वैमासिक प्रकाशित लेखहरूमा समाविष्ट भावना र विचार
लेखक स्वयंका निजी हुन् ।

- सम्पादक मण्डल



सूचना तथा प्रसारण विभागले वि.सं. २०२७ देखि प्रकाशन गरिरहेको नेपाल द्वैमासिक पत्रिका, वर्ष ५०, अङ्क ६, जेठ/असार, २०७८ अङ्क प्रकाशित गरी विद्वत पाठक वर्गहरूसमक्ष प्रस्तुत गर्न पाएकोमा हर्षित छौं। यस अङ्कमा शुभेच्छुक पाठकहरूलाई प्राविधिक विषयान्तर्गत ईन्जिनियरिङ पक्षसँग सम्बन्धित विविध विषयबारे जानकारी तथा सूचनाहरू उपलब्ध गराउनु यस पत्रिकाको उद्देश्य रहेको छ। यस पत्रिकालाई के कसरी अझ बढी ज्ञानवर्द्धक, सार्थक एवं रुचीकर बनाउन सकिन्छ भन्ने सम्बन्धमा यहाँहरूको सुझाव एवं प्रतिक्रियाको अपेक्षा राखेका छौं। आगामी अङ्कहरूमा सुझाव अनुसार परिमार्जित एवं अझ बढी राम्रो प्रस्तुत गर्ने हाम्रो प्रयास रहने छ।

कोभिड-१९ को कारणले बन्दाबन्दी भएको अवस्थामा पनि विषयविज्ञहरूले आफ्नो लेख रचनाहरू उपलब्ध गराई यस अङ्कलाई समयमै प्रकाशन गर्न सहयोग गर्नु भएकोमा सम्पूर्ण लेखकहरूलाई धन्यवाद ज्ञापन गर्दछौं। प्रकाशन गरिने विषयहरूको छनौट, लेखकहरूको छनौट, फोटो व्यवस्थापन, सम्पादन गरेर पत्रिकालाई यस अवस्थामा प्रकाशन गर्न कटिबद्ध यस विभागका कर्मचारी, विषयविज्ञका साथै प्रकाशन कार्यमा सहयोग गर्नुहुने मुद्रण विभागप्रति आभार व्यक्त गर्दछौं।

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नेपाल द्वैमासिक

विषय सूची

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An approach for reducing the pollution of Kathmandu valley: vehicle washing centre at the entry point of Kathmandu valley



✍️ Gogan Bahadur Hamal*

1. Introduction

1.1 Background

Kathmandu Valley is geographically bowl-shaped with total area 665 square kilometer. Its central lower part stands at 1,425 meters above sea level. Kathmandu valley is surrounded by four mountain ranges: Shivapuri hills (at an elevation of 2,732 meters), Phulchowki (2,695 meters), Nagarjun (2,095 meters) and Chandragiri (2,551 metres). The major river flowing through the Kathmandu Valley is the Bagmati.

The valley is made up of the Kathmandu District, Lalitpur District and Bhaktapur District covering an area of 570 km². The valley consists mainly of the municipal areas of Kathmandu, Patan, Bhaktapur, Kirtipur and Madhyapur Thimi; the remaining area is made up of a number of municipalities and rural municipalities (in Lalitpur district). The valley is a cultural and political hub of Nepal. The valley

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has the long history of the civilization and prosperity in art and architecture. The Kathmandu valley was accorded the status of a World Heritage Site by UNESCO in the year 1979. There are several important pilgrimage sites for Hindus and Buddhists within the valley. One of the major responsibilities of this time is to preserve the state of natural environment and all important monuments. Furthermore, these themes have been taken as the prime concern for the sustainable development in the global context.

Existing trend of the population growth, physical infrastructure, and other economic activities have led to confinement of the natural environment. Rapid Urbanization being the burning issue for all mega cities and in the main cause of air, water and soil pollution. Emission and particulate matters generated by the vehicle movement are major cause of impact to the nature. The regulatory mechanism for the control of vehicle emission has been confirmed by the Motor Vehicle and Transport Management Act, 1993 and respective regulation.

The dust transported by the vehicle tyre and its body underneath especially those coming through muddy roads outside the valley is considered to be major source of dust in Kathmandu valley. The tippers and other construction material carrying vehicles carry mud and dust into the road of the Kathmandu valley through their tires. There are in total 7 entry points to the valley; Nagdhunga, Dakshinkali (Pharping), Lele, Bhaktapur, Mudhkhu Bhanjyang (Balaju), Sankhu and Tokha and entry point at Nagdhunga is the busiest one. The study is aimed at the defining the pros and cons of the establishment of vehicle washing centers at the entry points into the Kathmandu Valley.

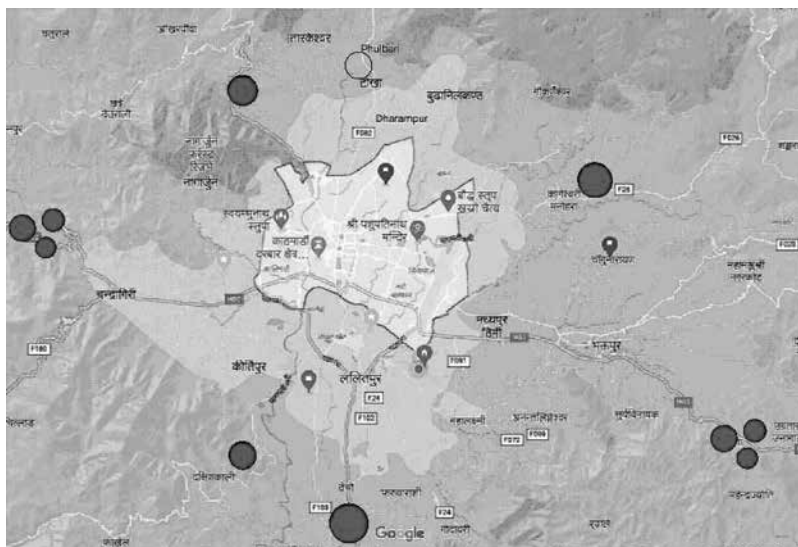


Figure: Entry Points to the Kathmandu Valley

1.2 Emission from the Vehicles

The emission from vehicles can broadly be classified into exhaust and non-exhaust emission. The exhaust emission is caused by burning air-fuel mixture inside internal combustion engine of the vehicle and non-exhaust emission is the emission that comes from sources other than combustion of fuel.

1.3 Exhaust Emission

Vehicle exhaust emissions are created when the air-fuel mixture burning inside internal combustion engines releases carbon dioxide back into the atmosphere. Diesel-powered, gasoline-powered, and hybrid vehicles all produce vehicle exhaust emissions; as the fuel used to power them contains hundreds of differently structured hydrocarbons that burn at different rates in different ways.

The composition of exhaust emissions from gasoline-powered or diesel-powered vehicles differs depending on the individual vehicle's operating characteristics, as well as the type of fuel used. The majority of vehicle exhaust emissions are composed of carbon dioxide, nitrogen, water vapor, and oxygen in unconsumed air. Carbon monoxide, unburned fuel, nitrogen oxides, and particulate matter such as mercury are also present in vehicle exhaust emissions in smaller quantities. A number of these substances play a significant role in vehicle-related air pollution, and carbon dioxide – a greenhouse gas – contributes to climate change.

1.4 Non-exhaust Emissions

The emissions that come from sources other than combustion of fuel in motor vehicles are called non-exhaust emissions. Such emissions can result from wears in parts like brake, clutch and tire or from corrosion of vehicle components. Re-suspension of road dust is also another source of non-exhaust emission. Non-exhaust emission contains fine particles, which can fall onto the road surface or be blown away into the surrounding air causing air pollution. Rain or storm water can take the particles to fields or water bodies causing soil or water pollution.

1.5 Evaporative emission

Evaporative processes can account for a significant portion of gaseous hydrocarbon emissions from gasoline vehicles. Volatile hydrocarbons evaporate from the fuel system while a vehicle is refueling, parked or driving.

In a typical system, vapors from the fuel tank and carburetor bowl vent (on carbureted vehicles) are ducted to canisters containing activated carbon. The vapors are adsorbed within the canister, and during certain engine operational modes

fresh air is drawn through the canister, pulling the vapor into the engine, where it burns. If the canister is saturated or there are leaks in the system, vapors can bypass the emissions control system directly to the atmosphere. Liquid leaks can occur anywhere in the fuel system. Moreover, refueling displaces the vapor in the tank and can also result in spillage.

1.6 Brake Wear

Friction arising in brake pad and lining during the braking process can result into abrasion and generation of particles. The chemical composition of brake pad materials, the friction speed, rate of rotation of wheels, pressure, temperature and resistance of weight being stopped can affect the rate of wear in brake. Brake dust contains Aluminum, Barium, Calcium, Copper, Iron, Potassium, Magnesium, Antimony, Tin and Zinc.

1.7 Tire wear

The rubbing of tire against the road surface produces particles of tire materials. Tire is made up of different materials like steel, rubber, carbon and other organic and inorganic compounds. Tire particles contain Aluminum, Calcium, Iron, Sodium, and Zinc along with organic compounds like styrene butadiene rubber, benzothiazole and polycyclic aromatic hydrocarbons.

1.8 Road Surface Wear

Road surface wear particles are produced as a result of the shear forces caused by the relative movement of the surfaces during the interaction between the road surface and a vehicle's tire. Concrete surfaces are comprised of sand, cement and small rocks/stones, whereas asphalt surfaces consist mainly of bitumen. Road surface wear particles contain concentrations

of Silicon, Calcium, Chromium, Iron, Potassium, Nickel, Vanadium and Zinc.

1.9 Re-suspension of Road Dust

Road dust undergoes a cycle of suspension in the atmosphere and deposition on the ground as a result of turbulence from passing vehicles and the effects of the wind. Re-suspended road dust is a complex mixture of particles which originate from natural and anthropogenic sources, and the composition of road dust correlates strongly with local particle emissions. Re-suspension of road dust is thought to be the largest contributor to non-exhaust particle emissions.

1.10 Washing of Vehicles and Non-Exhaust Emissions:

Vehicle owners generally wash their vehicles out of their own desire to make the vehicles clean and appealing without any specific aim to reduce the non-exhaust emissions. Vehicles with dust particles, carbon residues, oils, grease or mud adhering to their body parts can contribute to pollution in urban areas. Washing of vehicles at strategic entry points can lead to reduction in air, soil or water pollution in urban areas. Government of Nepal is planning to set up vehicle washing center(s) at the major entry points into the Kathmandu valley. The uncovered area and the recently under constructed roads inside the Kathmandu valley also contribute in increasing the dust and mud in the main road. The contribution of construction materials carrying vehicle likes tippers, trucks in air pollution inside the Kathmandu valley is tremendous.

1.11 Regulation of Vehicle Washing

Vehicle washing at the first instance appears to be a normal

activity that doesn't need to be regulated by law. The process of vehicle washing itself, however, can lead to other series of environmental problems if the water coming out from the washing process is not properly treated prior to release into drainage system that discharges into water bodies like streams, rivers or lakes. The effluent from washing process contains many dissolved chemicals, un-dissolved substances, grease, oil and soap. Many countries strictly prohibit Washing of vehicles in public places, streams, rivers, lakes or other water bodies. Pouring or draining of chemical substances into any stream or drainage that does not flow into a sewer system is prohibited to prevent contamination of water bodies. One of the main objectives of the standards and guidelines enforced by countries for vehicle wash centers is to minimize the possible adverse environmental impact the effluents from such centers can have.

1.12 Policy Review

Various policies, act, rules, standards related the vehicles and vehicle pollution are briefly discussed below.

1.12.1 Constitution of Nepal

Constitution of Nepal, 2015 has defined 'Right Regarding Clean Environment' as a fundamental right of citizen in the article 30. This article ensures right of each person to live in clean and healthy environment and right to get compensation if get victimized by environment pollution and degradation.

1.12.2 Fifteenth Periodic Plan

Some major provisions in 15th periodic plan related to vehicular pollution and its management are as follows:

- a) To establish automatic vehicle pollution measuring

facilities in provincial level.

- b) To promote the use of electric vehicles and mass transport.
- c) To establish vehicle fitness and testing centers at provincial level.

1.12.3 National Transport Policy, 2058

The main aim of this policy is to contribute the development of economic, cultural, social and tourism related sector with development of sustainable, economical, safe, facilitated and dependable transport system. The major focus of this policy is on development of road network throughout the nation but there are some provisions on management of vehicles as well as promotion of electric vehicles, which are as follow.

- a) To expand solar and electric vehicle network system throughout the country.
- b) To develop public transport system, safe, dependable, facilitated, pollution free, easily available and within the economic capacity of general public.
- c) To prohibit motor vehicles in core city areas
- d) In city area, to operate bus, tram or vehicle which run on solar, electricity or gas.
- e) To prohibit operation of vehicles causing air and noise pollution.

1.12.4 Environment Friendly Vehicle and Transport Policy, 2071

It is the main government policy with vision to attain sustainable, economic, social and environmental development thorough safe, facilitated, easily available

and dependable environment friendly vehicle and transport service. Some of the major provisions in this policy are as follow.

- a) To promote the use of environment friendly vehicles and make the share of environment friendly vehicles in total vehicles, 20 percent by 2020.
- b) To encourage, protect and promote the assembling and production of environment friendly vehicles like electric, solar, gas, hybrid vehicles within the country and facilitate them with easy mechanism of registration and route permit and with further subsidy and other provisions in prevailing finance related acts, if required.
- c) To encourage the operation of charging stations and facilitate them with continuous electricity supply in subsidized rate.
- d) To encourage and promote transformation of old and polluting petrol and diesel vehicles into electric vehicles.

1.12.5 Vehicle and Transport Management Act, 2049 and its Regulation, 2054

Vehicle and Transport Management Act, 2049 focuses on providing easy transport facility to public, developing transport effective service, preventing road accidents and compensating victim in case of accidents. The provision for registration of vehicles, licensing, traffic management, insurance, penalizing etc. has been covered by the act in its different sections. According to the act, vehicles in Nepal are broadly classified into following categories based on weight of vehicle:

- a) Heavy Vehicle: It includes the vehicle with weight more than ten ton. According to part A of schedule 1, bus, truck, tractor, dozer, loader, crane etc. are in this category.
- b) Medium Vehicle: It includes the vehicle with weight more than four ton and less than ten ton. According to part B of schedule 1, minibuss, mini-truck, van, pickup etc. are in this category.
- c) Light Vehicle: It includes the vehicle with weight less than four ton. According to part C of schedule 1, car, jeep, van, motorcycle, power tiller, tempo etc. are in this category.

1.12.6 Environment Protection Act, 2019 and Regulation 2020

Environment Protection Act, 2019 and Environment Protection Regulation, 2020 are major legal instruments for the protection of environment and human health in Nepal. The provisions related to environment pollution, environment impact assessment and initial environment examination, formulation of environment standards, penalizing mechanism in case of violation, compensation mechanism etc. are there in the Act and Rules.

Previously there was Environment Protection Act, 1997 and Rules 1997. As per the power given by Rule 15 of Environment Protection Rules, 1997, the Ministry of Environment had formulated Nepal Vehicle Mass Emission Standard, 2056 (Euro I Equivalent) and Nepal Vehicle Mass Emission Standard, 2069 (Euro III Equivalent).

1.12.7 Nepal Vehicle Mass Emission Standard, 2069

The first vehicle mass emission standard was promulgated in 2056. It was equivalent to Euro I standard. In 2069 Government of Nepal revised the standard and formulated Nepal Vehicle Mass Emission Standard, 2069 which is equivalent to Euro III. It is the prevailing emission standard for the all vehicle being imported to Nepal.

1.12.8 Green Sticker Standard

The main objective of Green Sticker System is to control emission from vehicle during its operation. Previously, it was applicable in very few locations within Kathmandu Valley but from 17 August 2018, it has become mandatory in all metropolitan cities and sub-metropolitan cities. The Government of Nepal has set the emission level for petrol and diesel vehicles. All vehicles should test their emission parameters from Transport Offices in the specified time interval. The vehicle will get green sticker if emission of the vehicle is within the limit. The vehicles without green sticker are not allowed to enter in the specified areas.

1.13 Vehicle Import/Registration in Nepal

Various types of vehicles are imported through the authorized importer. Some leading importers in Nepal are Sipradi Trading Pvt. Ltd. importing vehicles of TATA motors, Agni Incorporated Pvt. Ltd. importing vehicles of Mahindra, Laxmi intercontinental Pvt. Ltd. importing vehicles of Hyundai, Syakar Trading Company Pvt. Ltd. importing vehicles of Honda, Arun Intercontinental Traders importing vehicles of Maruti SUZUKI etc.

Registration of 4-Wheeler Vehicles

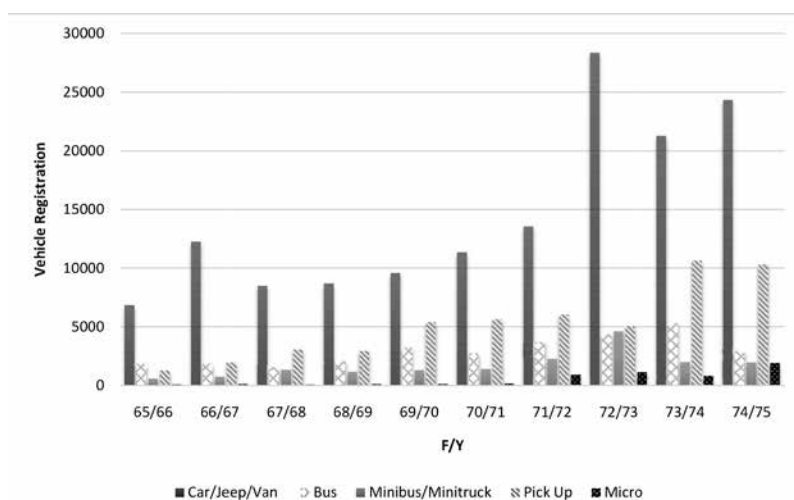


Figure: Registration of 4 Wheelers in Nepal

The figure above shows the trend of registration of 4-wheeler vehicles in Nepal in the last decade. The registration of car, jeep and van being the highest among all kinds of 4-wheeler vehicles registration. In fiscal year 2072/73 number of car/jeep/van registration was more than two times that of previous year. In fiscal year 2064/65, annual registration of car/jeep/van was less than 5,000 but in fiscal year 2074/75, it became almost 25,000.

The pickup has taken second position after car/jeep/van. The registration of pick up is also growing rapidly in last decade. The number of pick up registration in a year has been slightly more than one thousand till F/Y 065/66 but has increased to more than ten thousand in last F/Y 074/75. Unlike the registration of car/jeep/van and pick up, the registration of bus, minibus, micro bus and mini truck has not increased sharply but some growth can be seen in the graph.

Registration of Heavy and Agricultural Equipment

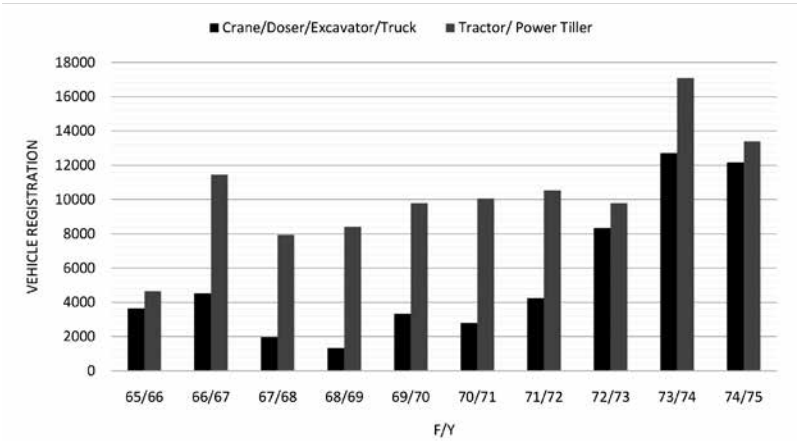


Figure: Registration of Construction and Agricultural Equipment in Nepal

The figure above shows the registration of heavy equipment like crane, dozer, excavator, truck and agricultural equipment like tractor and power trailer indicating a significant growth in registration of these equipment in last decade.

Registration of Motorcycles

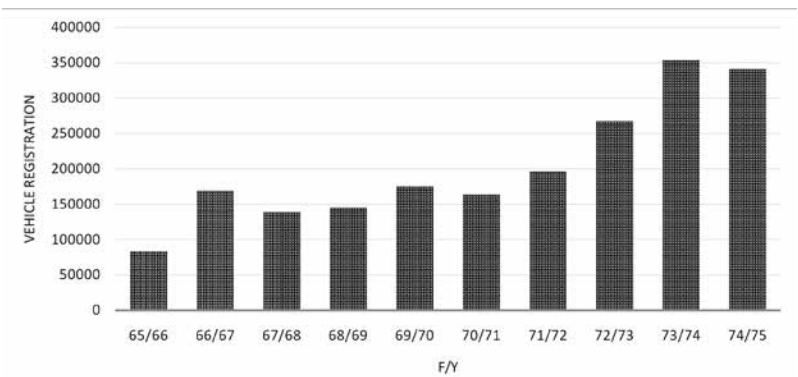


Figure: Registration of Motorcycles in Nepal

The figure above shows registration of motorcycles in last decade throughout the country. It indicates a gradual annual increase in registration of motorcycle and an increase of two fold in last 5 years.

1.14 Composition of Vehicle Registration

According to the Department of Transportation Management, the total number of vehicles registered in the Nepal till F/Y 2074/75 is 32,21,042. Within this total figure, the share of two wheelers is 79 % as shown in figure 4.

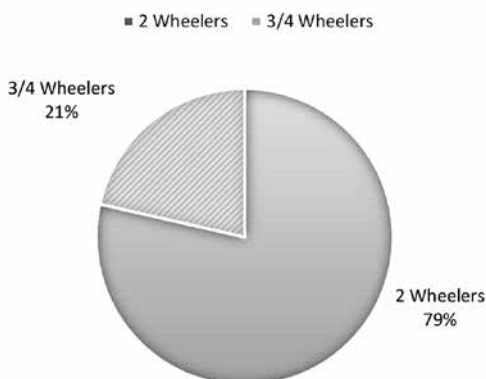


Figure: Share of 2-Wheelers and 3/4-Wheelers in Total Vehicle Registration

Among various kinds of three and four wheeler, share of car/jeep/van is largest of the order of 34 percent as shown in figure below.

With the increase income level of people, the trend in increasing vehicle import is expected to grow further in coming days. This increasing vehicle is not only causing difficulty in traffic management in city areas but also resulting in road accidents, environment pollution as well as trade deficit of the country.

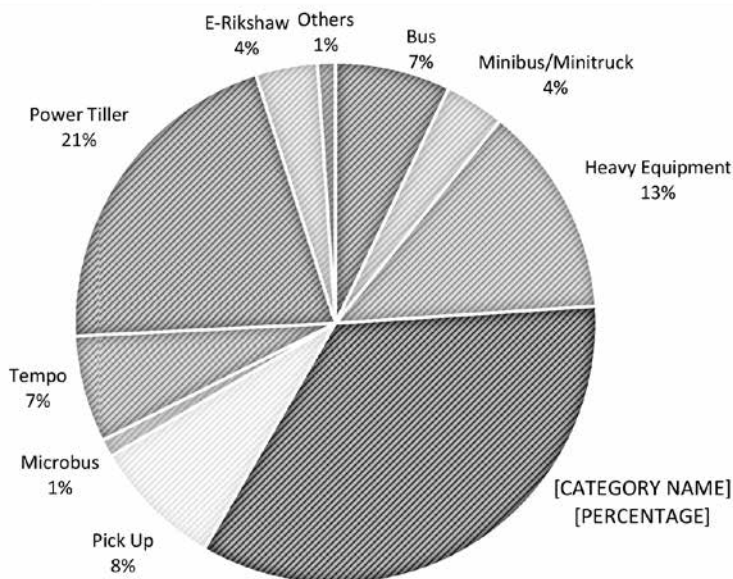


Figure: Composition of Vehicle Registration in Nepal

1.15 Vehicle Movement into Kathmandu Valley

There are several points to enter into Kathmandu Valley. Among them Nagdhunga, Bhaktapur, Pharping and Mudukhu Bhanjyang are major. Beside these, few vehicles enters Kathmandu valley through Lele, Sankhu and Tokha.

Metropolitan Traffic Police Division has provided the data of vehicles entered into Kathmandu valley during last two fiscal years. The vehicle entry data for various locations are given in the tables below.

Vehicle Entry from Nagdhunga

(Due to Covid-19, Only 8 month Vehicle data were taken for study.)

Table 1: Vehicle Entry From Nagdhunga (monthly average)

	Shrawan	Bhadra	Asoj	kartik	Mansir	Paush	Magh	Falgun	Average
Bus	29531	26878	35130	36033	33078	27198	25612	27109	30071
Truck	30470	30328	23362	31691	31133	29657	18981	17969	26699
Tanker	3655	3393	3814	2925	3239	5687	2956	2951	3578
Small Vehicle	28038	25512	37601	61625	48074	28745	24202	24351	34769
Government	4075	972	964	1085	1113	1018	680	544	1306
Ambulance	1398	1406	1425	1453	1615	1392	683	620	1249
Indian	1040	923	1141	1372	1463	1164	811	646	1070
Diplomatic	1056	953	1017	934	1154	986	577	498	897
Motor Cycle	59935	56418	57282	72760	59922	53942	46786	46031	56635
Micro	7330	6482	7040	8422	8395	6992	6857	7349	7358

Vehicle Entry from Bhaktapur

Table 2: Vehicle Entry from Bhaktapur

Types	Shrawan	Bhadra	Asoj	kartik	Mansir	Paush	Magh	Falgun	Average
Bus	12514	12565	19756	19217	16362	17149	16721	17270	16444
Truck	8457	7363	4538	3733	4688	4222	5922	6660	5698
Tanker	962	1063	648	948	1707	1423	776	912	1055
Small Vehicle	47766	63583	136420	194686	163562	169846	121540	99560	124620
Government	808	636	597	454	1334	1028	3762	915	1192
Ambulance	709	699	733	611	1168	889	865	982	832
Indian	774	503	426	572	1945	1217	645	867	869
Diplomatic	497	413	246	223	340	390	201	238	319
Motor Cycle	75067	76829	115514	164607	163569	141193	125549	166520	128606
Microbus	0	0	0	0	19476	0	0	0	2435

Vehicle Entry from Mudhkhu

Table 3: Vehicle Entry from Mudhkhu

Types	Shrawan	Bhadra	Asoj	kartik	Mansir	Paush	Magh	Falgun	Average
Bus	468	237	383	545	558	565	500	555	476
Truck	71	48	44	70	61	72	90	108	71
Tanker	50	38	22	42	47	52	50	80	48
Small Vehicle	377	748	349	278	388	379	233	312	383
Government	75	43	32	61	72	53	77	86	62
Ambulance	54	38	33	57	48	46	51	73	50
Indian	2	1	0	0	0	0	2	1	1
Diplomatic	8	7	0	0	2	1	15	4	5
Motor Cycle	4589	4143	4708	4626	4693	4503	4266	4952	4560
Microbus	0	0	0	0	0	0	0	0	0

Vehicle Entry from Pharping

Table 4: Vehicle Entry from Pharping

ColumnI	Shrawan	Bhadra	Asoj	kartik	Mansir	Paush	Magh	Falgun	Average
TATA Sumo	6940	8273	9495	12223	12053	11575	10993	11860	10427
Small Vehicle	2671	3006	2929	2928	2937	2594	2743	3070	2860
Government	204	290	249	181	157	236	288	314	240
Indian	339	396	464	630	346	491	374	343	423
Motor Cycle	4118	4815	5426	6181	5304	5008	5356	5908	5265

The tabulated data clearly indicates that busiest entry point to enter Kathmandu valley is Nagdhunga. Despite of the classification by traffic division, for washing purpose, they can be classified into large vehicle, small and medium vehicle and 2 wheelers. As ambulances cannot be imposed for washing, these can be omitted from calculation. Similarly, micro bus,

diplomatic, government and Indian vehicles also can be classified as small and medium vehicles and bus, truck and tankers are classified as large vehicles.

2. Introduction to Vehicle Wash Center

Vehicle Wash Center is a facility used to clean the exterior and, in some cases, the interior of motor vehicles. Car washes can be self-serve, fully automated, or full-service with attendants who wash the vehicle but still most of the vehicles are washed unlawfully either at home or in rivers and streams in Nepal.

Regarding the technology, there are various technologies available for vehicle washing. Manual wash, semi-automatic or automatic systems are widely being used. But as our focus is to reduce the dust carried by vehicles, partial washing of the vehicle is sufficient. The partial washing includes under body, Wheels, tires Mud-flaps and lower half of the body.

A semi-automatic system will be used to wash large and medium/small vehicle and for washing of 2-wheelers, it will be manual system.

In the large and medium/small vehicle wash bay, the driver will drive the vehicle slowly over the ramp. The nozzles of 5 to 6 in number from bottom and 2 on each side will spray high pressure water jet to the lower parts of the vehicle to remove the muds from the vehicle. The piping system with high pressure nozzles connected to pressure washer should be arranged at each wash bay. A wash man at each wash bay will operate pressure washer and instruct the driver if required.

The washing of 2 wheelers will be similar as that in workshop. Different wash bays will be made to wash number of bikes and scooters at a time.

2.1 Manual Wash Center

In a Manual Wash Center, the processes like pre-washing, applying soap or detergent, scrubbing, washing, rinsing or blowing are carried out by a service person or the vehicle owner himself. Such center is generally equipped with air compressor and water pumps. Vehicles are mounted over a ramp during the wash. The effluent is discharged into a drainage System or reused after treatment. A small or medium vehicle requires around 100 liters of water for a wash and a large vehicle requires around 150 to 200 liters of water for a wash. The time required for a wash will be longer and will depend on the speed of the service person. This type of center cannot handle a large number of vehicles.



Manual Car Wash (Picture Source: Shutterstock)



Manual Bus Wash (Source: chiefsaustralia.com)

2.2 Semi-Automatic Wash Center

In a semi-automatic wash center, some activities of the washing process are automated and some activities are carried out manually. A hydraulic lift may be used for lifting small or medium sized vehicles above the ground. Such center is equipped with air compressor, servicing machine, water pump and other machines depending on the activities that are automated. Water requirement will be almost similar to

that of a manual wash center. The time required for washing a vehicle can be shorter compared to a manual wash center. A semi-automatic wash center too cannot handle large number of vehicles in a day.



Lift- Car Wash (Picture Source: exportersindia.com)



Lift Bus Wash (Source: indiamart.com)

2.3 Steam Wash (A type of Semi-automatic Wash System)

This is a type of semi-automatic washing process that utilizes steam below 100 oC and around pressure of 8 bars for cleaning a vehicle. The steam comes from an electrically operated steamer. The steam outlet can be equipped with moisture control valve to clean very dirty or muddy vehicles. No waste



A Steamer (Picture Source: alibaba.com)



Steam Wash (Source: varhagenleiden.com)

water is produced during steam wash but the process can be longer. It may require around 20 minutes to wash a small or medium vehicle. The process requires very less water compared to water wash. Around 3 to 5 liters of water will be enough for washing a vehicle. Steam wash can be used to clean the interior of the vehicle too.

2.4 Automatic Wash Center

A conveyor belt or platform may be used to move the vehicle into the washing bay, tunnel or enclosure. The driver may manually drive the vehicle into the bay. Once the vehicle is properly positioned at the bay all the activities like applying soap or detergent, washing, rinsing, waxing, and drying are done automatically. The system uses regulated amount of water and chemicals. It may take approximately 5 minutes for washing a car and 10 minutes for washing a bus or a truck. Automated vertical brushes and roof brush are used to clean the front, rear, sides and top of the vehicle. A high pressure system is used to direct jets of water at required parts of the vehicle. This type of wash center is most suitable for washing large number of vehicles in a day.



Touch less Automatic Car Wash (Picture Source: topchinasupplier.com)



Touch less Bus Wash (Source: alibaba.com)

Under Chassis Wash is done to clean the dirt from the bottom areas of the vehicles. Pre-wash is done to loosen the dirt on the vehicle body. Soap or detergent is applied to remove dirt, oil, grease or stains on the body of the vehicle. High pressure water jet is used to remove the soap or detergent foam. Automated brushes are used to softly rub the surface. Blower is used to dry the vehicle at the exit.



Brush Car Wash (Picture Source: carwash.com)



Brush Bus Wash (Source: indiamart.com)

Automatic washing of a small or medium vehicle may include following steps.

- | | |
|----------------------|-------------------------------|
| ● Under chassis wash | ● Pre wash |
| ● Soap spray rinse | ● Brush wash |
| ● Blower | ● Tire shiner spray |
| ● Silicon wax spray | ● Triple shine foam wax spray |



Under Chassis Wash System
(Picture Source: nissanclean.com)



Wheel Wash System
(Source: indiamart.com)

Automatic washing of a bus or truck may include following steps.

- Under chassis wash
- Pre-wash
- Foam soap/chemical spray for cleaning
- High pressure washing/three brush washing
- High pressure washing (if brush system is used)
- Skirt brushes (optional)
- Tanker brushes (optional)
- Exit blower

3. Modality of Establishment and Operation

3.1 Private Sector Participation

The government should allow the private sector to build and operate the vehicle wash centers in accordance with the above mentioned requirements. Proposals should be invited from interested companies/firms and the company/firm that commits to provide the washing service at lowest service charge for partial wash should be permitted to set up the wash centers.

3.2 Leasing of Land by the Government

Considering the high cost and scarcity of sizeable plots of land in and around Kathmandu valley, the government may lease public/private land to the selected company/firm for establishing Vehicle Wash Center.

3.3 Enforcement of Partial Vehicle Wash as a Mandatory Procedure:

The Government of Nepal or the Bagmati Provincial Government can make partial vehicle wash in authorized wash center mandatory for all vehicles entering Kathmandu valley by introducing appropriate provision in prevailing federal or state transport law or environmental law. Partial vehicle wash means an automatic washing sequence in which the underbody, wheels, tires and lower half of the vehicle will be washed using water or steam.

3.4 Ceilings for Service Charge:

The government should set the maximum ceilings for service charges for partial wash for various entry points entering into the Kathmandu Valley for certain of time e.g. a period of 5 years.

3.5 Changes in Service Charge:

The initially selected company/firm shall not be allowed to increase the service charge for a period of at least 5 years. After the period, the company will need to take approval from the government to increase the service charge. The government will approve an increment in the service charge after taking into consideration the real rate of increase in the cost of factors associated with vehicle wash service industry.

4. Conclusion

Based on the above analysis and discussions following conclusions are drawn:

- i. To improve the air quality of the Kathmandu Valley, it is necessary to establish vehicle wash center at all entry point to the Kathmandu Valley.
- ii. Considering the volume of vehicle inflow, time and resources required for washing, the partial washing would be best which includes wheels, tires, mud flaps, under body and lower parts of the vehicle.
- iii. Considering the technologies available for vehicle washing, semi automatic washing system is suitable for large and medium/small vehicle and manual washing system for 2-wheelers.
- iv. To mitigate, the water pollution to local area, a proper waste water treatment system is required at each wash center and to minimize the ground water extraction, treated water should reused as much as possible.
- v. The private parties should be encouraged to invest in this project and government should facilitate for their establishment and easy operation.
- vi. Before establishing the vehicle wash center at the entry points of the Kathmandu valley, there should be mud free environment within the Kathmandu valley. For this the uncovered area should be covered with various techniques and the muddy roads should be blacktopped.
- vii. Development of standards and guidelines for operation of any types of washing center in the country is urgently required.
- viii. From the above simple financial analysis, it is found that the business of washing centers established for the

purpose of partial washing of vehicles entering into the Kathmandu valley is lucrative. So the private sectors may show their keen interest for that business.

- ix. Wherever necessary and if private land is not available at desirable location, the government should lease the required area of land.

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अनलाइन सञ्चारमाध्यमको अवस्था र व्यवस्थापन



भरत गौतम*

विश्व सञ्चार, सूचनाको विकास र पहुँचले गर्दा साँगुरो हुँदै गएको छ । संसारको कुनै घटना र परिघटनाहरू तुरन्तै संसार भरी प्रसारित हुने र त्यस घटना र परिघटनाले मानिसको सौँच र धारणा प्रस्फुटित भई समाजिक, राजनीतिक र आर्थिक क्षेत्रमा प्रभाव पारेको हुन्छ । सूचना एउटा शक्तिको रूपमा रहेको पाइएको छ भने सञ्चार सूचना प्रवाह गर्ने साधन भएको छ । सूचनाले सञ्चारको माध्यमबाट समाचारको आदान प्रदान गर्दछ ।

नेपालमा सूचना र सञ्चारको विकास र पहुँचले गर्दा सबै क्षेत्रमा सकारात्मक प्रभाव पारेको छ । समाचार प्रकाशन र प्रसारणको क्षेत्रमा सूचना प्रविधिको प्रगतिले निकै फड्को मारेको पाइन्छ । आजको मानवीय आवश्यकताको पूर्ति गर्न सूचना प्रविधिको प्रयोग अपरिहार्य भएको छ । विश्व भरीको समाचार छिटो समयमा सबैले प्राप्त गर्ने सक्ने पूर्वाधारमा नेपाल सक्षम हुँदै गएको छ । नेपालमा समाचार प्रकाशन र प्रसारणको भएको प्रगतिले नागरिकलाई सु-सूचित गर्न धेरै मद्दत पुगेको छ । पत्रपत्रिकाको प्रकाशनको सहज अवस्था वि.सं. २००७ सालपछि भएको हो । प्रजातन्त्रको उदयसँगै छापाखाना सम्बन्धी कानूनी व्यवस्थापछि समाचार प्रकाशनका लागि अनुकूल हुँदै गएको देखिन्छ ।

सञ्चारमाध्यमको इतिहास हेर्दा गोरखापत्रको प्रकाशन नै नेपालको पहिलो समाचार पत्रिकाको रूपमा लिन सकिन्छ । गोरखापत्र सरकारी सञ्चारमाध्यमको

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रुपमा स्थापना गरिएको हो । नेपालमा पत्रपत्रिकाको प्रकाशनको सहज अवस्था राणा शासन कालमा थिएन । वि.सं.२००७ सालपछि नागरिकको हक अधिकार स्थापित भयो र समाचार संकलन तथा प्रकाशन गर्न थालिएको हो । वि.सं.२०१७ पछि प्रजातन्त्रको भूमिकामा संकट उत्पन्न भएपछि सञ्चारमाध्यममा नियन्त्रण शुरु भयो र सञ्चारमाध्यम खुम्चिन पुग्यो । वि.सं.२०४६ पछि नेपालमा व्यवसायिक सञ्चारमाध्यमको शुरुवाती भएको भन्ने भनाइ छ । बहुदलीय व्यवस्थाको पुर्नस्थापनापछि मात्र सञ्चार क्षेत्र व्यवसायिक रुपमा समाचार प्रसारण र प्रकाशनका लागि स्थापना भइ नागरिकलाई सु-सूचित गर्न थालिएको पाइन्छ ।

समाचार संकलनपछि प्रकाशन र प्रसारण गर्ने विभिन्न माध्यमहरु छन् । सञ्चारमाध्यमको श्रव्यदृष्य, ध्वनी र प्रकाशनको माध्यमबाट सूचना र समाचारहरु नागरिकले प्राप्त गर्दछन् । रेडियो, टेलिभिजन र पत्रिका प्रकाशनबाट दर्शक, श्रोता र पाठकले सूचना र समाचार प्राप्त गर्ने सुविधा पाएका छन् । नागरिकमा समाचार र सूचनाको पहुँच बढ्दै गएको छ । प्रविधिको विकासले गर्दा सूचना र समाचार प्रसारण र प्रकाशन सरल र सहज भएको छ र नागरिकमा यसको उपयोगिता बढ्दै गएको छ ।

आमसञ्चार क्षेत्रमा सूचना र समाचारको अनलाइन प्रकाशन र प्रसारणले सञ्चार क्षेत्रको द्रुत प्रगति हुँदै गएको छ । सेवा प्रवाहमा अनलाइन सेवाले पुर्‍याएको योगदान सबै क्षेत्रमा बढ्दै गएकोमा सञ्चार क्षेत्रमा अनलाइनको प्रभाव अझ बढी देखिएको छ । प्रस्तुत लेखमा नेपालमा अनलाइनसञ्चारमाध्यमको अवस्था, प्रगति र त्यसको व्यवस्थापनका सम्बन्धमा वर्णन गरिने छ ।

आमसञ्चारमाध्यमको नियमन र सहजीकरण गर्न नीतिगत र कानूनी व्यवस्था गरिएको छ । नेपालको मूल कानून नेपालको संविधानको धारा १९ मा सञ्चारको हकको व्यवस्था गरिएको छ । विद्युतीय प्रकाशन, प्रसारण तथा छापालगायतका जुनसुकै माध्यमबाट कुनै समाचार, सम्पादकीय, लेख, रचना वा अन्य कुनै पाठ्य, श्रव्यदृश्य सामग्री प्रकाशन तथा प्रसारण गर्न वा सूचना प्रवाह गर्न प्रतिबन्ध लगाइने छैन भन्ने व्यवस्था रहेको छ । तर सार्वभौमसत्ता, भौगोलिक अखण्डता, राष्ट्रियता वा संघीय इकाईबीचको सु-सम्बन्ध वा जात जाति, धर्म वा सम्प्रदायबीचको सु-सम्बन्ध खलल पर्ने, राज्यद्रोह, गाली बेइज्जती वा अदालतको अवहेलना हुने वा अपराध गर्न दुरत्साहन गर्ने वा सामाजिक शिष्टाचार, नैतिकताको प्रतिकुल कार्य गर्न र जातीय छुवाछुत एवं लैंगिक भेदभावलाई दुरुत्साहन गर्ने कार्यमा मनासिव

प्रतिबन्ध लगाउने गरी ऐन बनाउन रोक लगाएको मानिने छैन भन्ने प्रतिबन्धात्मक व्यवस्था गरिएको छ ।

कुनै श्रव्य, श्रव्यदृश्य वा विद्युतीय उपकरणको माध्यम वा छापाखानाबाट कुनै समाचार, लेख, सम्पादकीय, रचना, सूचना वा अन्य कुनै सामग्री वा प्रकाशन वा छापेबापत त्यस्तो सामग्री प्रकाशन, प्रसारण गर्ने वा छान्ने रेडियो, टेलिभिजन, अनलाइन वा अन्य कुनै किसिमको डिजिटल वा विद्युतीय उपकरण, छापा वा अन्य सञ्चार माध्यमलाई बन्द, जफत वा दर्ता खारेज वा त्यस्तो सामग्री जफत गरिने छैन तर कुनै कुराले रेडियो, टेलिभिजन, अनलाइन वा अन्य कुनै किसिमको डिजिटल वा विद्युतीय उपकरण, छापाखाना वा अन्य सञ्चारमाध्यमको नियमन गर्न ऐन बनाउन बन्देज लगाएको मानिने छैन भन्ने व्यवस्था गरिएको छ । कानूनबमोजिम बाहेक कुनै छापा, विद्युतीय प्रसारण तथा टेलिफोनलगायतका सञ्चार साधन अवरुद्ध गरिने छैन भन्ने उल्लेख छ । संविधानको भाग ४ को राज्यका निर्देशक सिद्धान्त, नीतिको राजनीतिक तथा शासन व्यवस्था सम्बन्धी नीतिमा आम सञ्चारलाई स्वच्छ, स्वस्थ, निष्पक्ष, मर्यादित, जिम्मेवार र व्यवसायिक बनाउन आवश्यक व्यवस्था गर्ने भनिएको छ ।

संविधानमा भएका समाचार प्रकाशन र प्रसारण सम्बन्धी व्यवस्थाले नेपालमा सञ्चारगृह स्थापना गर्न सजिलो र सरल बनाएको छ भने अनलाइन सञ्चारमाध्यमको विकासका लागि सहज वातावरण सिर्जना भएको छ । सञ्चारमाध्यमलाई राज्यको चौथो अंगको रूपमा हेरिएको पाइन्छ । सञ्चार गृह आर्थिक क्रियाकलापको क्षेत्रको रूपमा स्थापित हुन थालेको अवस्था छ ।

सूचना तथा सञ्चार प्रविधिको प्रयोगबाट नेपाललाई सूचना तथा ज्ञानमा आधारित समाजमा रूपान्तरण गर्ने सोच सूचना तथा सञ्चार प्रविधि नीति, २०७२ ले लिएको छ । प्रस्तुत नीतिले राज्यका सबै क्षेत्रलाई सोमेटेर नीतिगत सम्बोधन गर्न खोजेको छ । त्यसै गरी राष्ट्रिय आम सञ्चार नीति, २०७३ ले विविधता र बहुलवादलाई प्रतिनिधित्व गर्ने स्वतन्त्र, स्वच्छ नेपाली समाजप्रति उत्तरदायी र जिम्मेवार बनाउन तथा अन्तर्राष्ट्रिय सम्बन्ध सुदृढ गराउने एवं आन्तरिक सुशासन प्रवर्द्धन गर्ने, भौगोलिक अखण्डता, संघीय सम्बन्ध सुदृढ गर्ने, जातीय, भाषिक र साँस्कृतिक सम्बन्ध कायम गर्ने, ज्ञान, विज्ञान, स्वास्थ्य, शिक्षा र वातावरण संरक्षण गर्ने र सूचनाको पहुँच सबै क्षेत्रमा पुर्‍याई शासकीय सञ्चालनमा कुशलता प्रदान गर्ने जस्ता विषयलाई जोड दिएको छ ।

सूचना प्रविधियुक्त राष्ट्रको सौँचसहित आमसञ्चार सबै नागरिकको पहुँचमा पुऱ्याइ आम नागरिकको जीवनस्तरमा गुणात्मक परिवर्तन ल्याउने पन्ध्रौँ योजनाले लक्ष्य लिएको छ भने पूर्ण प्रेस स्वतन्त्रताको सुनिश्चितता गर्दै आम सञ्चारमा सबै नागरिकको पहुँच विस्तार गर्ने रणनीति लिइएको छ । सञ्चार क्षेत्रको समग्र विकासको लागि आवश्यक पर्ने नीतिगत, कानूनी तथा संरचागत क्षेत्रमा समयानुकूल सुधार गरिने, सार्वजनिक आमसञ्चार माध्यमलाई स्वायत्त, प्रतिस्पर्धी, मर्यादित, उत्तरदायी र व्यवसायिक बनाइने, सार्वजनिक आमसञ्चार माध्यमको क्षमता अभिवृद्धि गर्दै स्थानीय तहदेखि प्रदेश, राष्ट्रिय र अन्तर्राष्ट्रिय स्तरसम्म क्रमशः पहुँच विस्तार गर्नुका साथै राष्ट्रिय समाचार समितिको प्रभावकारिता अभिवृद्धि गर्ने, प्रदेश स्तरमा आधुनिक र प्रविधियुक्त सञ्चार ग्रामको स्थापना गर्ने र प्रेस काउन्सिललाई मिडिया काउन्सिलको रूपमा रूपान्तरण गरी अनुगमन प्रणालीलाई प्रभावकारी बनाइने कार्यनीति पन्ध्रौँ योजनाले लिएको छ ।

आम सञ्चारमाध्यम पूर्णरूपमा मर्यादित, जिम्मेवार, जवाफदेही, उत्तरदायी हुन नसक्नु जस्ता समस्याहरु छन् । आम सञ्चारका माध्यममा प्रसारित समाचार मर्यादित र विश्वसनीय बनाउनु, भ्रामक समाचारको नियमन गर्नु, समाजिक सञ्जालको वृद्धिसँगै यसमा बढ्दै गएको दुरुपयोग नियन्त्रण गर्नु चुनौतीहरु छन् । पूर्ण प्रेस स्वतन्त्रता, सञ्चार तथा सूचनाको हकको प्रत्याभूति हुनु, डिजिटल नेपालको अवधारणाले महत्त्व पाउनु, सूचना र सञ्चार क्षेत्रको बढ्दो अवसरले गर्दा नागरिक सवल र सक्षम हुँदै जानु जस्ता आम सञ्चारका अवसरहरु पनि छन् । यी सबै नीतिगत र कानूनी व्यवस्था आमसञ्चार माध्यमको नियमन र सहजीकरणका लागि भएका हुन ।

विश्वमा अनलाइन सञ्चार माध्यमको प्रभावकारिता बढ्दै गएको र नेपालमा पनि अनलाइन सञ्चारमाध्यम समाचार प्रवाहको प्रभावकारी माध्यमको रूपमा स्थापित हुँदै गएको छ । नेपालमा अनलाइन सञ्चारमाध्यमको प्रभावकारिता बढ्दै गएको कारण अनलाइन श्रोता, दर्शक र पाठकहरु बढ्दै गएको पाइन्छ । इन्टरनेटको सुविधामा मोबाइल र कम्प्युटरको माध्यमबाट अनलाइन खबर हेर्न, पढ्न र सुन्न सकिने तथा आवश्यक खबर र सूचना स्टोर र लिइक गर्न पाइने हुँदा अनलाइन खबरको महत्त्व बढ्दै गएको छ । मोबाइल प्रयोगकर्ता बढ्दै गएको अवस्थामा अनलाइन खबरको उपयोगिता बढ्दै जाने अपेक्षा गरिएको छ ।

सूचना र सञ्चारको क्षेत्रमा सूचना र प्रविधिको विकासले अनलाइन सञ्चारमाध्यमबाट समाचार र सूचना प्रकाशन र प्रसारण गर्न धेरै सजिलो र प्रभावकारी भएको छ ।

प्रसारण र प्रकाशनको क्षेत्रमा ध्वनी, श्रव्यदृश्य र प्रकाशनबाट सूचना र समाचार प्रवाह गर्न अनलाइन आधुनिक सञ्चार प्रणालीको रूपमा आएको छ । अनलाइन समाचार र सूचना प्रसारण र प्रकाशन दर्शक, श्रोता र पाठकमा लोकप्रीय सञ्चारमाध्यमको रूपमा स्थापित भएको छ ।

अनलाइन सञ्चारमाध्यमलाई व्यवस्थापन गर्न सुशासन (व्यवस्थापन तथा सञ्चालन)ऐनको दफा ४५ले दिएको अधिकार प्रयोग गरी अनलाइन सञ्चार माध्यमको नियमन र सहजीकरण गर्न अनलाइन सञ्चारमाध्यम सञ्चालन निर्देशिका, २०७३ जारी भएको छ । इन्टरनेटमा आधारित प्रविधिको प्रयोग गरी समाचार, सूचना, विचार, तस्बिर वा श्रव्यदृष्यलगायतका समाचार मूलक वा जानकारीमूलक सामग्रीहरुको उत्पादन, प्रकाशन, प्रसारण वा वितरणको प्रयोजनका लागि संकलन गरी कानूनबमोजिम स्थापित भइ सम्पादकीय र पत्रकारिताको सिद्धान्त पालना गरी सकेत, चिन्ह, अक्षर, आवाज, ग्राफिक्स, गीत, सङ्गीत, भिडियो, विभिन्न बहुमाध्यमको प्रयोग गरी संदेश मूलक वा विषयगत विचार, सूचना तथा समाचार, तस्बिर, श्रव्यदृश्यको रूपमा उत्पादन, प्रकाशन, प्रसारण वितरण गर्ने विधि, पक्रिया र माध्यमलाई अनलाइन सञ्चारमाध्यम भनिएको पाइन्छ । अनलाइन सञ्चारमाध्यम सञ्चालन निर्देशिकामा दर्ता र सञ्चालन, नवीकरण, जनशक्ति व्यवस्थापन, अभिलेख, पत्रकार आचार संहिता तथा प्रकाशनको जिम्मेवारी एवं प्रसारण र प्रकाशन गर्न नपाइने जस्ता विषयलाई वर्णन गरी नियमन र सहजीकरणमा जोड दिइएको छ ।

अनलाइन सञ्चारमाध्यमबाट प्रकाशित र प्रसारित समाचारको महत्त्व बढ्दै गएको कारण श्रोता, दर्शक र पाठकलाई सूचना र समाचार प्राप्त गर्न अनलाइन सञ्चारमाध्यमले निकै सजिलो बनाएको छ । पाठक, दर्शक र श्रोतालाई इन्टरनेट सुविधाबाट जतिबेला पनि सूचना र समाचार आफ्नो मोबाइल र कम्प्युटरबाट हेर्न, सुन्न र पढ्न सक्ने सुविधा प्राप्त हुने हुँदा सजिलो भएको अनुभूति भएको छ । उद्यमी र व्यापारीलाई व्यापार र व्यवसायको प्रवर्द्धन गर्न विज्ञापनका लागि अनलाइन सञ्चारमाध्यमको प्रयोग लोकप्रिय भएकोले विज्ञापन बजार बढ्दो अवस्थामा देखिएको छ ।

नेपालमा अनलाइन सञ्चारमाध्यमलाई वैधानिकता दिएपछि अनलाइन सञ्चारमाध्यम दर्ता र सञ्चालन गर्ने कार्य बढ्दै गएको देखिन्छ । नेपालको पहिलो अनलाइन सञ्चारमाध्यम हुलाकी मिडिया प्रा.लि. मिति २०७३ चैत्र ९ गते दर्ता

भएको पाइन्छ । नेपालको हाल सम्मको अनलाइन सञ्चारमाध्यम दर्ता स्थिति यस प्रकार रहेको छ ।

आ.व.	दर्ता संख्या
२०७३/७४	४०७
२०७४/७५	४७२
२०७५/७६	५७३
२०७६/७७	५३३
२०७७/७८ (हाल सम्म)	६५७
जम्मा	२६४२

आ.व. २०७३/७४ मा ४०७ अनलाइन सञ्चारमाध्यम दर्ताभएको छ भने आ.व. २०७७/७८ को जेष्ठ मसान्तसम्म ६५७ अनलाइन सञ्चारमाध्यम दर्ता भएकोले क्रमशः बढ्दो स्थिति छ । हालसम्म अनलाइन सञ्चारमाध्यमको २६४२ दर्ता भएको पाइन्छ ।

प्रस्तुत तथ्याडबाट अनलाइन सञ्चारमाध्यमको दर्ता प्रक्रिया बढ्दो अवस्थाले सूचना र सञ्चारको क्षेत्रमा अनलाइन सञ्चारमाध्यमको प्रभाव बढ्ने देखिन्छ । अनलाइन सञ्चारमाध्यम स्थापना सरल र कम लगानीमा गर्न सकिने हुँदा आम सञ्चार क्षेत्रमा अनलाइनको प्रभुत्व बढ्दै गएको हो । अनलाइन सञ्चारमाध्यमका दर्शक, श्रोता र पाठकको चाखलाई ध्यानमा राखी सूचना र समाचार प्रस्तुत गर्न सकिने, समयानुसार समाचार प्रस्तुत गर्ने, डिजाइनहरु बदल्न सकिने जस्ता सुविधाहरु हुन्छ । सूचना र समाचारको तुरुन्त प्रतिक्रिया दिन र लिन सकिन्छ । समाचारको पहुँचका लागि लिङ्क र सब्सक्राइब गर्ने तथा सेभ गर्न सकिने सुविधाहरुसमेत हुने हुँदा पाठकलाई धेरै फाइदा भएको छ । अनलाइन सञ्चारमाध्यमको सुविधा मोबाइलबाट समेत सजिलै हेर्न, पढ्न र सुन्न सकिने हुँदा यसको प्रभावकारिता अझ बढ्दै गएको हो ।

नेपालको परिप्रेक्ष्यमा विद्युत सेवाको सबै ठाउँमा विस्तार हुन केही समय लाग्ने देखिन्छ भने इन्टरनेटको सञ्जालको पहुँच सबै क्षेत्रमा पुगी नसकेको अवस्थामा अनलाइन सञ्चारमाध्यमलाई व्यवस्थित गर्न कही चूनौतिहरु देखिएका छन् । तर अनलाइन सञ्चारमाध्यम श्रोता, दर्शक र पाठकका बिच लोकप्रीय बन्दै गएको छ । अनलाइन सञ्चारमाध्यमको सूचना र समाचार जति बेला पनि हेर्न, सुन्न र पढ्न

सकिने हुँदा सूचना र समाचारका पारखीहरूलाई समय समयमा सूचना र समाचारमा अपडेट हुन मद्दत पुगेको छ । पाठक, दर्शक र श्रोताहरूको चाख र आवश्यकतालाई ध्यान दिइ सूचना र समाचारहरूको कम्पोज गरी उपयुक्त समाचार र सूचना प्रकाशन र प्रसारण गर्न अनलाइन सञ्चारमाध्यम भरपर्दो हुँदै गएको छ । विश्वको जुनसुकै कुनामा अनलाइनमार्फत आफ्नो जन्मस्थानको ताजा समाचार हेर्न, सुन्न र पढ्न पाइने हुँदा देश देशबीच सीमाना नभएको जस्तो अनुभूति भएको छ ।

अनलाइन सञ्चारमाध्यमको नियमन र सहजीकरणमा अनलाइन सञ्चारमाध्यम सञ्चालन निर्देशिकाले नसोमेटिएका विषयहरू धेरै छन् ।

अनलाइन सञ्चारमाध्यमको दर्ता र नवीकरण गर्दा निःशुल्क हुने व्यवस्था गरिएको छ । अनलाइन सञ्चारमाध्यम मात्र होइन यो एउटा उद्यम पनि हो । अनलाइन सञ्चारमाध्यमको नियमन र सहजीकरण गर्न पनि यसको दर्ता र नवीकरणमा शुल्क अनिवार्य गर्नु पर्दछ । शुल्क निर्धारण गर्ने विषय सम्मानित संसदको हो । यसका लागि सञ्चारकर्मी उद्यमी, सञ्चार तथा सूचना प्रविधि मन्त्रालय र सरोकार पक्षले शुल्कको विषयमा एउटा निचोडमा पुग्न आवश्यक छ । प्रिन्ट मिडियाले आफ्नो प्रकाशन अनलाइनमा प्रस्तुत गर्दछ । उक्त विषयलाई समेत दर्ता र नवीकरणमा छुट्टै प्रकारले सम्बोधन गर्दा राम्रो हुन्छ । अनलाइन सञ्चारमाध्यमको केन्द्रिकृत अवस्था बढी भएको गुनासो छ । प्रदेश तहमा विविधीकरण गरी अनलाइन सञ्चारमाध्यम दर्ता गर्न सके पत्रकारिताको सबैतिर फैलावट हुने र सूचना र समाचारको सञ्जाल बढ्ने अपेक्षा गरिएको छ ।

अनलाइन सञ्चारमाध्यमको वर्गीकरणको विषय उठेको छ । उद्यमशीलता, सञ्चार क्षेत्रमा रहेको भूमिका, रोजगारी र आर्थिक क्रियाकलापको अवस्था, सञ्चारमाध्यमको व्यवसायिक सीप तथा सञ्चारमाध्यमको विश्वसनीयता जस्ता विषयलाई जोड दिइ अनलाइन सञ्चारमाध्यमको वर्गीकरण गर्न उपयुक्त हुन्छ । अनलाइन सञ्चारमाध्यमको समाचारको विषय विज्ञताको आधारलाई पनि वर्गीकरणमा समावेश गर्नु राम्रो हुन्छ ।

अनलाइन सञ्चारमाध्यमलाई सूचना र समाचार प्रवाहमा उत्तरदायी बनाउने भन्ने विषय पनि चूनातिको रुपमा रहेको छ । सञ्चारमाध्यमले पस्केका सूचना र समाचारमा उ आफै जवाफदेही हुनुपर्ने र त्यसको जिम्मेवारीको बोध स्वयं सञ्चारमाध्यमले लिनु पर्दछ ।

अनलाइन सञ्चारमाध्यमको पेइङ प्रणालीको विकास गर्नु पर्ने विषय पनि उठेको छ । तर हाम्रो पाठकको स्तर त्यहाँसम्म पुगेको पाइँदैन । पाठक, दर्शक र श्रोताको आयश्रोतमा बढोत्तरी भएमा एवं अनलाइन सञ्चारमाध्यमको विश्वसनीयता, व्यवसायीकता र प्रभावकारिता बढ्दै गएमा पेइङ प्रणालीले सफलता प्राप्त गर्न सक्छ ।

अनलाइन सञ्चारमाध्यमको युट्युबका समाचारहरूको आधिकारिकता र नियमनका विषयमा धेरै प्रश्न उठेका छन् । यो विषयलाई समयमै व्यवस्थापन गरिएन भने यसले धेरै ठूलो विकृति ल्याउने संभावना छ भने युटुबरहरूलाई छाडा छोडियो भने अरु सञ्चारमाध्यमलाई समेत असर पुग्ने अनुमान गरिएको छ । यो समस्या समाधान गर्न सरकार, सञ्चार क्षेत्र तथा पत्रकारहरूले आवश्यक पहल गर्नु पर्दछ ।

अनलाइन सञ्चारमाध्यममा प्रतिलिपि अधिकारका विषयहरू पनि उठान भएका छन् । सञ्चारमाध्यमका सृजनाहरूको संरक्षण गर्ने र त्यसको फाइदा सर्जक, दर्शक, श्रोता र पाठकले लिने अधिकार रहन्छ । समाचारहरूको चोरी गर्ने, साभार गर्ने अनुमति नलिने तथा कपि-पेष्ट गर्ने विषयलाई समयमै नियन्त्रण गर्नतर्फ ध्यान दिनु आवश्यक छ ।

अनलाइन सञ्चारमाध्यममा काम गर्ने श्रमजीवी पत्रकारको सेवा सुविधाका विषयमा पनि ध्यान दिनुपर्ने हुन्छ । सञ्चार उद्यमशीलताको भर्खर मात्र विकास हुन थालेको अवस्थामा श्रमजीवी पत्रकारको अधिकारको विषय सुस्त गतिमा अघि बढेको छ । पत्रकारहरूको अवसर बढोत्तरी हुँदै छ । अवसरहरू जति बढी हुन्छन् श्रमजीवी पत्रकारको अधिकार गौण हुन्छ । अनलाइन सञ्चारमाध्यम थोरै लगानीमा पनि सञ्चालन गर्न सकिने हुँदा त्यहाँ काम गर्ने श्रमजीवीको अधिकारलाई विशेष ध्यान दिनुपर्ने देखिन्छ ।

अनलाइन सञ्चारमाध्यममा काम गर्ने पत्रकारको आचार संहिताका विषयमा पनि बहस हुन जरूरी छ । पत्रकारिताको धर्म र पेशाप्रतिको जवाफदेहिता र जिम्मेवारी विपरित आधार प्रमाण र पुष्टि विना समाचार लेख्ने नागरिकको इज्जत प्रतिष्ठाको ख्याल नगर्ने उल्टै मोलमोलाई गर्ने गरेका घटनाहरू पनि प्रसस्तै छन् भन्ने गुनासो रहेको छ । ती समस्याको समाधान गर्न प्रेस काउन्सिलको व्यवस्था गरिएको छ । प्रेस काउन्सिललाई मिडिया काउन्सिलमा रुपान्तरण गरी आम सञ्चारमाध्यमलाई व्यवस्थित र मर्यादित बनाउन आवश्यक छ ।

छापाखाना र प्रकाशन सम्बन्धी ऐन, २०४८ ले अनलाइन सञ्चारमाध्यमलाई चिन्दैन । अनलाइन सञ्चारमाध्यममा छापाखाना सम्बन्धी विषय गौण हुने तर प्रकाशनको विषय महत्त्वपूर्ण हुन्छ । अनलाइन सञ्चारमाध्यमलाई व्यवस्थित गर्न समसामयिक प्रकाशन र प्रसारण सम्बन्धी कानूनको आवश्यकता रहेको छ ।

अनलाइन सञ्चारमाध्यमले टेलिभिजनको सुविधाबाट सूचना र समाचार प्रवाह गरेका छन् । तर त्यस्तो सुविधा दर्ता प्रक्रिया मै उल्लेख गर्नु पर्ने र ती सञ्चार गृहको नियमनको छुट्टै व्यवस्था गर्नु पर्दछ । अनलाइन सञ्चारमाध्यमले सञ्चारगृह सञ्चालन गर्दा सञ्चार व्यवसायिकताको आचारसंहितालाई विशेष ध्यान दिनु आवश्यक छ ।

आम सञ्चारमाध्यममा अनलाइन सञ्चारमाध्यमको बढ्दो प्रभावले आम नागरिकमा सकारात्मक प्रभाव देखिएको छ । अनलाइन सञ्चारमाध्यमबाट प्राप्त सूचना र समाचारको सहजताले गर्दा मानिसको जीवनस्तरमा परिवर्तन आएको अनुभूति भएको छ । नेपाल प्राकृतिक प्रचुरताको संभावना भएको देश भएकोले खोज पत्रकारितामार्फत नेपालको प्रसार प्रचार गरी आर्थिक क्रियाकलाप बढाउनु जरूरी भएको छ । यस विषयमा अनलाइन सञ्चारमाध्यम प्रभावकारी हुने देखिन्छ ।

आम सञ्चार क्षेत्रमा अनलाइनको बढ्दो प्रभावसँगै समस्या र चुनौतिहरु पनि छन् । नेपालको संविधानको अनुसूची ५, ६, ७, ८ र ९ मा स्थानीय तह, प्रदेश र संघका एकल, दुई तहबीच र संयुक्त शासकीय अधिकारको व्यवस्था गरिएको छ । आमसञ्चार क्षेत्रको संघको अधिकारमा रेडियो फ्रिक्वेन्सी बाँडफाँड, रेडियो, टेलिभिजन, हुलाक र दूरसञ्चारजस्ता विषयको अधिकार भएको, प्रदेशको अधिकारमा रेडियो, एफ एम र टेलिभिजन सञ्चालनको अधिकार भएको, प्रदेश र संघको संयुक्त अधिकार क्षेत्रमा सञ्चार माध्यम सम्बन्धी रहेको र स्थानीय तहको एफ.एम. सञ्चालनको अधिकार रहेको देखिन्छ । आमसञ्चारको नियमन र सहजीकरण गर्ने काम संघ र प्रदेश बढी देखिन्छ भने स्थानीय तहले एफ एम सञ्चालन गर्ने अधिकार पाएको छ । संविधानमा केही स्पष्ट व्यवस्था भएता पनि सबै तहको आम सञ्चारलाई समेट्ने गरी कानूनको अभाव देखिएको छ । आम सञ्चारसहित अनलाइन प्रकाशन र प्रसारणको अधिकार भएको सञ्चारमाध्यमलाई कानूनी दायरामा ल्याउन ढिलो गर्नु हुँदैन । निर्देशिकाले मात्र अनलाइन सञ्चारमाध्यम नियमन गर्दैन ।

आमसञ्चार माध्यममा काम गर्ने पत्रकारहरुलाई समय अनुसार क्षमता अभिवृद्धि गर्ने विषय बहसको रुपमा आएको छ । आगामी आर्थिक वर्षको नीति र कार्यक्रममा

यो विषयले प्राथमिकता पाएको छ । पत्रकारको क्षमताका कारण नै समाचारले उत्कृष्टता प्राप्त गर्दछ । आम सञ्चारसहित अनलाइन सञ्चारमाध्यममा काम गर्ने पत्रकारहरूलाई क्षमता अभिवृद्धि जोड दिनु आवश्यक छ किन भने अनलाइन सञ्चारमाध्यम प्रविधिमैत्रि हुने र दर्शक, श्रोता र पाठकको चाखलाई ध्यान दिनु पर्ने हुँदा पत्रकारको सवलीकरणमा जोड दिनु आवश्यक छ । सूचना र समाचारको सम्पादन गर्दा विश्वसनीयता, पुष्ट्याँइका आधार र पेशागत धर्म जस्ता विषयमा विशेष ध्यान दिनु आवश्यक छ ।

अनलाइन सञ्चारमाध्यमको बढ्दो भूमिकालाई मध्यनजर गर्दै समग्र सञ्चार क्षेत्रलाई व्यवस्थित र मर्यादित बनाउन सबैले आफ्नो क्षेत्रबाट भूमिका निर्वाह गर्नुपर्ने देखिन्छ । समाचार र सूचना समाजका ऐना हुन समाज भित्रका यथार्थ स्थितिलाई सञ्चारमाध्यमले पस्कनु पर्दछ । त्यसले नै समाजको सुधार र परिवर्तन गर्न सक्दछ । सञ्चारमाध्यमको क्षमताको स्तरबाट नै समाज परिवर्तनको स्तर मापन हुन्छ ।

सन्दर्भ सामग्रीहरू

- १) नेपालको संविधान ।
- २) सूचना तथा सञ्चार प्रविधि नीति, २०७२ ।
- ३) राष्ट्रिय आम सञ्चार नीति, २०७३ ।
- ४) पन्ध्रौँ त्रि-वर्षीय योजनाको आधार पत्र (२०७५/७६ देखि २०८०/८१) ।
- ५) अनलाइन सञ्चारमाध्यम सञ्चालन निर्देशिका, २०७३ (संसोधन समेत) ।

Clean feed necessity and impacts in Nepal



👉 Er. Sudip Bhattra^{*} Er. Krishna Jha^{**}

Background

Before talking in detail about clean feed, we need to know why this term came in existence in broadcasting sector and why this was coined in Nepal. The country entered the television era when the state owned Television called Nepal Television commonly known as NTV started broadcasting on 5 January 1984 (BS 2041). Due to lack of rules and regulation for private sector to invest in television industry, for a long time NTV was the only player in this sector in Nepal. It was 2049 B.S when the Government of Nepal issued National Broadcasting Act, 2049 to regulate and open the market for private sector in broadcasting sector. The government also issued National Broadcasting Rules, 2052 following the aforementioned act. These act and rules not only included the rules for local television but also have provision for foreign channel to broadcasting in the country. After this provision, the private sector started investing in television, radio and cable service provider. Also the foreign television channel got downlink permission to broadcasting in the country and the journey of foreign channel started. Currently 134 foreign has permission

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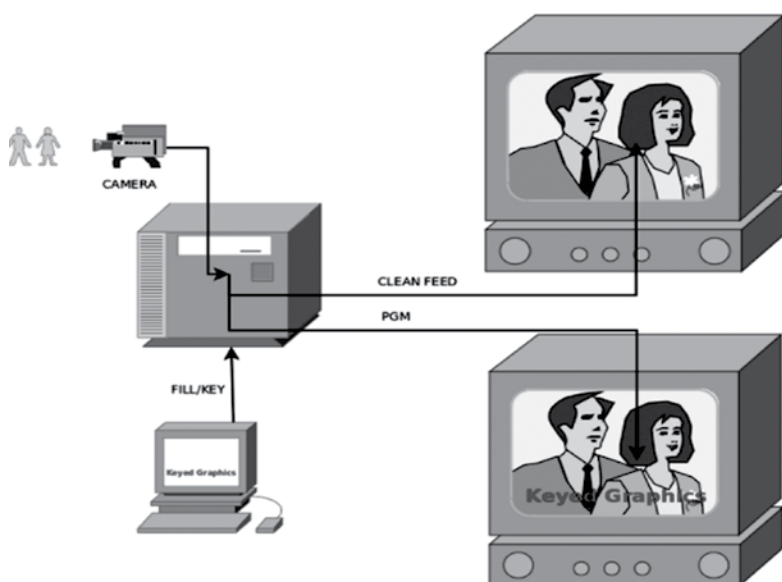
for broadcasting.

At that moment, there was no rules to prohibit the foreign channel to show advertisement in broadcasting. In National Broadcasting Rules, 2052 there was provision for without advertisement and with advertisement foreign channel downlink permission. So the foreign TV channels were broadcasting the advertisement legally. As time pass by, this sector started booming, the viewer of television and the customer of cable service provider also increased rapidly. The Share cast Initiative's 2017 survey depicts that 72 percent household in Nepal own a TV set and approximately 60 percent of people watch television every day. The viewing of foreign channel rate also increases day by day and apart from a few exceptions, almost all foreign channels carry commercial advertisement and Nepalese viewers are paying monthly charges to watch not only the program but the advertisement also. Which is kind of absurd and irony, Nepalese are paying their hard earned money to watch advertisement. Because of that, most of the advertisement played in foreign channel was made by foreign multinational company and shown in their language or dubbed in Nepali. So, obviously these advertisement don't have Nepali artist and other advertisement industry related actors. Which is hampering the growth of domestic advertising industry and employment prospects of artist, cameramen, editors and other actors related to this industry. And of course no tax or other related revenue is generated for government. This was the major point which drew attention of policy maker to make a law, which govern and monitor advertisement sector.

Clean feed

There are many definitions to clean feed. In television technology, a clean feed is a video signal that does not have added graphics and text or it is a signal which has not come

from the main output of the video switcher, such as the output of a vision mixer before the downstream keyed stage - the clean feed is identical to the main program output but without any captions keyed into it. This is also used to refer to backhaul feeds of television programming sent via communication satellite or other transport (such as a national fiber-optic network) sent from another TV station or remote television production truck on-location, which does not carry any television advertisements or break bumpers. So, simply it means advertisement free content of television channel broadcasting.



Necessity and its provision

Now a days, advertisement is as important as quality of the product itself, for the expansion of market and profit making. It's no secret that great advertising attracts customers, improves brand awareness, and generates revenue. There are many

platform for advertisement like print media, radio, television and currently online platforms like social site/application, YouTube etc. But interesting thing is social platforms, you tube are fastest growing area in advertising sector. Among these, television is most preferred choice for advertisements for both large and small businesses because it represents one of the most popular and widespread forms of media worldwide with around 1.6 billion households having one or more television sets. Television offers advertisers the ability to use motion, color and audio to send a strong and cogent message to the audience and it is also highly effective strategy when trying to appeal to and convert your target audience. According to IMARC Group's latest report, titled, "Global Television Advertising Market Report & Forecast 2021-2026", the global television advertising market reached a value of US\$ 278 Billion in 2020. However in this country, the exact size and volume of advertisement remains a matter of debate due to lack of reliable statistics. But many believe that market to be around NRs. 8 billion and 18% of the total advertising market i.e. NRs 1.5 billion is expected as Nepal's television advertising. However according to the Advertising Association of Nepal (AAN) total value of advertising market in the country, including the mass media and signage, has crossed Rs. 12 billion.

In this country a number of foreign TV channels as mentioned above are licensed to broadcast and most of them are Indian origin, which are popular to Nepalese viewer. So the foreign and multinational company are not preferring local Nepali television channel to reach the potential market of Nepali as their advertisement made for their own country and made by their local artist as well are broadcasted here so covering their viewer and Nepalese viewer as well. This has adverse impact on local advertisement market and the prosperity of Nepali televisions. Furthermore, the Nepali spent their hard earned money to view their advertisement too and the Nepal



government does not generate any revenue or tax from that. So this is striking factor for policy makers which resulted in publishing Nepal Broadcasting Act, 2019.

Initially, the Government of Nepal published clean feed policy 2073, which purpose was to generate the revenue and to increase the opportunity of employment by enhancing the local advertisement market and making the foreign channel advertisement free. The government of Nepal also published National mass communication policy, 2073, which also pointed out that the Government of Nepal will take necessary step to make foreign channel advertisement free broadcasting in the country.

On the basis of aforementioned policy background, The Advertisement (Regulation) Act 2019 was published in the Nepal Gazette on 25 October 2019 to regulate advertisement and market promotion or distribution of goods, service, programs or events in Nepal. This act define "**Advertisement**" as "any word, sentence, drawing, image, symbol, poster, pamphlet, publication, sign, structure or any other audio, visual or audio-visual publication or prepared for publication

in public regarding any product, service, event or occasion through the means including print, electronic media, online, social networks, hoarding board, balloon”. In the article 6 of the aforementioned act, there are following provisions.

Subdivision 1: The foreign channel will have to broadcast without ads.

Subdivision 2: The organizations who has done agreement of broadcasting of foreign channel after taking downlink permission at that time, will have to broadcast without ads within one year from the publication of this act. Furthermore subdivision 3 of the same article.

Subdivision 3: Nepal communication media cannot broadcast foreign ads by dubbing.

This act has defined six member Advertisement board and their formation process, work, duty and authority. The act has provision of penalty/punishment. The individual/ firm or organization will be penalized by Nrs. 0.5 million if they would violate article 6.

The department of information and broadcasting has installed Multi Viewer Streaming and Recording System to monitor 24x7 hour of foreign and local television channel broadcasted by different license holder operator of the country. The department also prepares the report of monitoring and submits it to the concerned authority to take action if the operator violate clean feed laws.

Impacts

It is believed that many sectors like advertisement industry, local television and the employment opportunity related with these domains will increase after implementation of this act.

The revenue and taxes collections of the Government will also increase. It is believed that the foreign multinational company advertisement will be broadcasted via local television and this will be an economic booster for the local television industry. Because of that the local television will have pressure to make quality programs and maintain the standards, which will decrease the dependency of the Nepalese viewers on foreign channel for quality and standard programs and help in preserving the language, culture, traditions, customs and originality of the country. The advertising agency and television industry will be self-sustained.

This policy is expected to bring direct and indirect positive affect and enhance several areas like growing advertisement and television industries is likely to boost innovation, stimulate more research and development, acting, entrepreneurship opportunity etc. New ideas and enterprises will come with these changes being crucial to the growth of local creative industries.

In addition to the above-mentioned aspects, it will also create opportunity for actors, filmmakers, produces, photographers, cameraman, musicians, scriptwriters and others talent related with this field. This will have cumulative effect in all sector of economy with growth, productivity, sales and employments.

The impact of policy are not yet visible because of the current pandemic situations. As pandemic has affected almost every sectors of the economy all over the globe and the global TV advertising market is expected to decline from \$102.02 billion in 2019 to \$96.92 billion in 2020 at a compound annual growth rate (CAGR) of -5:00%.

In conclusion, the clean feed policy will cease the broadcasting of foreign advertisement and open door for the multinational company to enter in Nepal and produce advertisements locally, which in turn will have positive effects in advertisement industry, television industry and other directly and indirectly

related field. This will result in boosting the revenue collection of the country and will be an economic oxygen for the GDP growth of the country.

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नेपालमा ईन्जिनियरिङ स्टाफ कलेज स्थापनाको आवश्यकता र औचित्य



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पृष्ठभूमि

नेपालमा ईन्जिनियरिङ व्यवसाय र यस क्षेत्रको विकास राणाकालिन शासन व्यवस्थाको उत्तरार्धबाट शुरु भएको पाइन्छ । कुमार नरसिंह राणा, किशोर नरसिंह राणा, डिल्लीजंग थापा जस्ता अग्रज ईन्जिनियरहरूले नेपालको भौतिक पूर्वाधार विकासमा महत्वपूर्ण योगदान पुऱ्याएको इतिहास हामीसँग छ ।

वि.सं २०२८ सालदेखि ललितपुरको पुल्चोकस्थित आनन्द निकेतन भवनबाट नेपालमा ईन्जिनियरिङ शिक्षाको डिप्लोमा तहको अध्ययन अध्यापन शुरु भएको हो । पञ्चायती शासन व्यवस्थाताका तत्कालिन सोभियत संघको विभिन्न विश्व विद्यालय, भारतको रुड्की विश्व विद्यालय तथा अमेरिकाको Full Bright छात्रवृत्ति अन्तर्गत थुप्रै नेपालीहरू ईन्जिनियरिङ विषयको उच्च शिक्षा अध्ययन गर्न जाने प्रचलन थियो । यसरी उच्च शिक्षा अध्ययन गरेर आइसकेपछि ईन्जिनियरहरूलाई रोजगारीको लागि समस्या थिएन सजिलै सरकारी सेवामा जागिर पाउँथे । ईन्जिनियरिङ पेशालाई अत्यन्त सम्मानजनक रूपमा हेरिन्थ्यो पनि । यो क्रम सँगै वि.सं. २०३६ सालमा ललितपुरको हालको पुल्चोक क्याम्पसमा ईन्जिनियरिङ सिभिल र अन्य विषयमा स्नातक तहसम्मको अध्ययन अध्यापन शुरु भयो र ईन्जिनियर बन्नको लागि नेपालमै अध्यापन शुरु भएपश्चात विदेशमा गई उच्च शिक्षा अध्ययन गर्ने नेपालीहरूमा कमि आउन थाल्यो । ईन्जिनियरहरू नेपालमै

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उत्पादन हुन थालेपछि सरकारी तथा गैरसरकारी क्षेत्र र विभिन्न आयोजनामा काम गर्ने इन्जिनियरहरू संगठित भई नेपाली इन्जिनियरहरूको पेशागत हकहितको सम्बर्द्धन गर्ने तथा देशको विकासमा महत्त्वपूर्ण योगदान गर्ने उद्देश्यका साथ सम्पूर्ण नेपालीहरूको छाता संगठनको रूपमा वि.सं. २०१९ सालमा अग्रज इन्जिनियरहरूको सामूहिक निर्णयबाट नेपाल इन्जिनियर्स एसोसिएसनको स्थापना भएको हो । नेपाल इन्जिनियर्स एसोसिएसनले राष्ट्रका लागि विभिन्न कालखण्डमा आफ्ना पेशागत अभिभारा र दक्षता अनुरूप योगदान पुऱ्याउँदै आइरहेको छ । वि.सं. २०४७ सालमा नेपालमा प्रजातन्त्र स्थापना भएपछि ईन्जिनियरिङ व्यवसायको लोकप्रियता र व्यपकता पनि बढ्दै गयो । उदार अर्थतन्त्र र नीजिकरणको अवधारणा अनुरूप सरकारी स्तरबाट मात्र नभै नीजि क्षेत्रबाट पनि नेपालमा क्रमिक रूपमा थुप्रै ईन्जिनियरिङ कलेजहरू सञ्चालनमा आए । यसरी सरकारी तथा निजि क्षेत्रका कलेजहरूबाट नेपालमा वर्षेनी हजारौंको संख्यामा इन्जिनियर/ आर्किटेक्टहरूको उत्पादन हुन थाल्यो । त्यसपछि ईन्जिनियरिङ शिक्षाको गुणस्तरमा ह्रास आउन नदिन र यो व्यवसायलाई मर्यादित, व्यवस्थित एवं प्रभावकारी बनाउनु पर्दछ भन्ने उद्देश्यका साथ ईन्जिनियरिङ कलेजहरूको लागि एउटा छुट्टै नियमनकारी निकायको आवश्यकतादेखि नेपाल इन्जिनियर्स एसोसिएसनकै सक्रिय पहलमा वि.सं. २०५५ सालमा ऐनमार्फत नेपाल ईन्जिनियरिङ परिषद्को स्थापना भएको हो । गुणस्तरीय ईन्जिनियरिङ शिक्षा र इन्जिनियरहरूको पेशागत मर्यादा कायम राख्न नेपाल ईन्जिनियरिङ परिषद् क्रियाशिल रहँदै आएको छ ।

ईन्जिनियरिङ व्यवसायको मर्यादा कायम राख्न गुणस्तरीय ईन्जिनियरिङ शिक्षा र त्यसपछि गुणस्तरीय पूर्वाधार निर्माण नै पहिलो शर्त भएको हुँदा अहिले नेपालमा विभिन्न विश्व विद्यालय मातहत थुप्रै ईन्जिनियरिङ कलेजहरू सञ्चालनमा रहेको र वर्षेनी करिब ८००० (आठ हजार) इन्जिनियर/आर्किटेक्टहरू उत्पादन हुने गरेको आँकडाले देखाउँछ । यसै विषयलाई मनन गर्दै गुणस्तरीय पूर्वाधारको निर्माण तथा विकासका लागि नेपालका ईन्जिनियरहरूको क्षमता, दक्षता एवं सीपको अभिवृद्धि गर्नु जरुरी छ । विश्वमा भइरहेको नविनतम विज्ञान र प्रविधिको विकासमा प्रतिस्पर्धा गर्न केवल सैद्धान्तिक ज्ञान र अध्ययनले मात्र पुग्दैन ईन्जिनियरिङ विषय मानव जीवनसँग प्रत्यक्ष सरोकार राख्ने विषय भएकोले यसको व्यवहारिक अध्ययन र अनुसन्धानको पक्ष पनि उत्तिकै महत्त्वपूर्ण हुन्छ । उच्च शिक्षा अध्ययन पश्चात सोभै आफ्नो व्यवसायमा प्रवेश गर्दा ईन्जिनियरहरूले आफ्नो क्षमता र दक्षतालाई भरपूर रूपमा प्रयोग गर्न सक्दैनन् । उसको ज्ञान र सिपमा निखार ल्याउन सम्बन्धित

विषयमा नियमित तालिम तथा प्रशिक्षणको आवश्यकता पर्दछ । यसका लागि नेपालमा एउटा छुट्टै ईन्जिनियरिङ स्टाफ कलेजको स्थापना हुन जरुरी छ भन्ने कुरा नेपाल इन्जिनियर्स एसोसिएसनले महसुस गर्‍यो । विगत दुई दशक देखिको अनवरत प्रयास तथा पहलकदमीका बाबजुद पनि Engineering Staff College स्थापनाले हालसम्म मूर्तरूप लिन नसकेको तितो यथार्थ हामीसँग छ । थुप्रै प्रक्रियागत अड्चन, प्रशासन सेवाका कर्मचारीहरूको उदासीपन र सरकार फेरवदल भइरहने कारणले पनि हालसम्म उलेख्य परिणाम हासिल गर्न सकिएको छैन । अमेरिका, युरोप लगायत दक्षिण एशियाली मुलुकहरूमा इन्जिनियरहरूको पेशागत विकास एवं क्षमता अभिवृद्धि गर्नको निमित्त व्यवस्थित रूपमा Engineering Staff College को स्थापना गरी सञ्चालनमा ल्याएका छन् । यस एसोसिएसनको प्रतिनिधी मण्डलले भारत, बंगलादेश, श्रीलंका जस्ता देशमा सरकारी सहयोगमा सञ्चालित Engineering Staff College हरूको स्थलगत अध्ययन गरी नेपालमा यसको आवश्यकता र औचित्यसमेतको पुष्ट्याँइसहित एसोसिएसनले केही वर्ष पहिले नेपाल सरकार समक्ष सो को विस्तृत प्रतिवेदनसमेत बुझाएको थियो । यो विषयलाई अर्जुनदृष्टिको रूपमा लिँदै निरन्तर सम्पर्कमा रही नेपाल इन्जिनियर्स एसोसिएसनले गठन आदेश होस् वा ऐनद्वारा होस् दुवै विकल्प प्रस्तुत गरी समय समयमा नेपाल सरकारको सम्बन्धित निकाय समक्ष जोडदार रूपमा पहल गर्दै आइरहेको छ । नेपाल ईन्जिनियर्स एसोसिएसनको निरन्तर प्रयास पछि नेपाल सरकारले गतः आर्थिक वर्ष २०७६/७७ मा बजेट भाषणमार्फत ईन्जिनियरिङ पेशाको दक्षता अभिवृद्धि गर्न तथा नयाँ प्रविधिमा अत्यावधिक गराउन ईन्जिनियरिङ प्रशिक्षण प्रतिष्ठाण (Engineering Staff College) को सम्भाव्यता अध्ययन गराउने भनी नीति तथा कार्यक्रममा समावेश गरेको थियो ।

अहिले Nepal Engineering Staff Collegeको भूमिकालाई प्रशिक्षणको क्षेत्रमा मात्र सिमित नगरी अनुसन्धानात्मक कार्यको भूमिकामा समेत स्थापना गरिनु पर्दछ भन्ने उद्देश्यका साथ “नेपाल ईन्जिनियरिङ प्रशिक्षण तथा अनुसन्धान प्रतिष्ठान” Nepal Engineering Training & Research Academy (NETRA) नाम राख्ने गरी नेपाल इन्जिनियर्स एसोसिएसनले सो ऐनको मस्यौदा तयार गरी विस्तृत प्रस्ताव तथा अवधारणा पत्रसहित नेपाल सरकार भौतिक योजना मन्त्रालयमा बुझाइसकेको र सो प्रस्ताव अर्थ मन्त्रालय हुँदै हाल प्रधानमन्त्री तथा मन्त्री परिषद्को कार्यालयमा विचाराधीन अवस्थामा रहेको व्यहोरा सम्पूर्ण इन्जिनियर महानुभावहरूलाई जानकारी गराउन चाहन्छु । यो प्रक्रियामा सहयोग

पुन्याउनुहुने माननीय भौतिक पूर्वाधार तथा यातायात मन्त्री बसन्त कुमार नेवाङ्गज्यू, नेपाल ईन्जिनियरिङ परिषद् तथा नेपाल परामर्शदात्रु समाज (SCAEF) लाई हार्दिक धन्यवाद दिन चाहन्छु ।

भूमिका

“समृद्ध नेपाल - सुखी नेपाली” को नारालाई साकार रूप दिन र देशलाई अति कम विकसित मुलुकको स्तरबाट मध्यम आय मुलुकको दर्जामा स्तरोन्नति गर्ने वर्तमान नेपालको महाअभियानलाई सफल पार्न नेपालको हालको प्राविधिक र व्यवस्थापकीय क्षमतामा सामान्य सुधारमात्र नभई गुणात्मक फड्को नै मार्नु पर्ने आवश्यकता छ । लामो समयको राजनीतिक अस्थिरता, सामाजिक द्वन्द र आर्थिक पछौटेपन व्योहोरेका नागरिकले देशको सामाजिक र आर्थिक क्षेत्रमा आमूल परिवर्तन र सामाजिक न्यायसहितको दीगो विकास र आर्थिक समृद्धिको तीव्र अभिलाषासँगै सुमधुर सपना देखेका छन् । देश र देशवासीको यो सपनालाई मूर्त रूप दिन देशको प्राविधिक जनशक्तिको क्षमता अभिवृद्धि र विकास व्यवस्थापनमा युगान्तकारी परिवर्तन आवश्यक छ । सोहि आवश्यकतालाई दृष्टिगत गर्दै नेपाल सरकारले पनि आफ्ना अल्पकालीन तथा दीर्घकालीन नीतिहरूमा प्राविधिक जनशक्तिको क्षमता अभिवृद्धि र विकास व्यवस्थापनमा मानवीय संसाधन विकासको अपरिहार्यतालाई समावेश गरेको छ । नेपाल सरकारद्वारा विगत वर्षहरूमा प्रस्तुत नीति तथा कार्यक्रममा मानवीय क्षमता विकास तथा पूर्वाधार निर्माण रेल, पानीजहाज, सुरुङ प्रविधि, खनिज अन्वेषण, जलाशययुक्त जलविद्युत जस्ता आयोजनालाई आवश्यक पर्ने प्राविधिक तथा व्यवसायिक दक्ष जनशक्ति विकास, प्राविधिक शिक्षामा नेपालको मौलिक कला, संस्कृति र ज्ञानको संरक्षण तथा प्रवर्धन गर्ने सीपयुक्त जनशक्ति विकास असल, सीपयुक्त र सिर्जनशील जनशक्ति विकास गर्न विज्ञान, प्रविधि र अनुसन्धानमा लगानी वृद्धि जस्ता नीतिगत विषयहरू समावेश गरिएका छन् । जसले देशको विद्यमान प्राविधिक र विकास व्यवस्थापनको क्षमतामा उल्लेख्य मात्रामा वृद्धि गर्नुपर्ने टड्कारो आवश्यकतालाई औल्याएको छ ।

माथि उल्लेख भएका प्राविधिक जनशक्तिको विकास र क्षमता अभिवृद्धिको आवश्यकतालाई केवल विद्यालय, तथा विश्वविद्यालयका औपचारिक शिक्षाले मात्र पूरा गर्न सक्दैनन् । विज्ञान तथा प्रविधिमा लगतार भइरहेको आविष्कार, अनुसन्धान र विकाससँगै उपलब्ध नयाँ-नयाँ उपायहरूको समय सापेक्ष उपयोग र

दिनदिनै सामना गर्नु परिरहेका नयाँ-नयाँ समस्याहरू हल गर्न सक्षम, दक्ष मानवीय संसाधनको विकासको लागि प्राविधिक जनशक्तिलाई निरन्तर र नियमित रूपमा प्रशिक्षित र अद्यावधिक गराइ राख्नु जरुरी हुन्छ। नेपालमै पनि प्रशासनिक क्षेत्रमा सो आवश्यकतालाई सम्बोधन गर्न नेपाल प्रशासनिक प्रशिक्षण प्रतिष्ठान कार्यरत छ। प्राविधिक क्षेत्रमा भने सडक, विद्युत, खानेपानी, सिंचाई, दूरसञ्चार जस्ता क्षेत्रका प्राविधिक निकायले आ-आफ्नै पहलमा तालिम, प्रशिक्षण, क्षमता अभिवृद्धि र निरन्तर शिक्षाको आवश्यकतालाई जसोतसो काम चलाउ ढंगबाट सञ्चालन गरिरहे पनि प्राविधिक जनशक्तिको निरन्तर शिक्षा, तालिम-प्रशिक्षण, क्षमता अभिवृद्धि र ज्ञान-सीपलाई निरन्तर अद्यावधिक गराई राख्ने एउटा स्थायी र एकिकृत संरचना नेपालमा अबै अस्तित्वमा आइसकेको छैन। राष्ट्रिय योजना आयोगले आ.व. २०६६/६७ मा ईन्जिनियरिङ स्टाफ कलेजको स्थापनाको आवश्यक तयारीको लागि कार्यदल बनाई काम शुरु गरेको र भवन विभागमार्फत सम्भाव्यता अध्ययन गराइएको भएता पनि सरकार परिवर्तनसँगै सरकारी प्रतिबद्धताको अभावमा सो प्रयासले निरन्तरता पाउन सकेन। अन्तर्राष्ट्रिय तहमा समेत यस सम्बन्धी निरन्तर शिक्षाको आवश्यकतालाई सम्बोधन गर्न अन्य विकासशील तथा विकसित देशमा पनि ईन्जिनियरिङ स्टाफ कलेजको व्यवस्था गरिएको हुन्छ, जसमार्फत प्राविधिक जनशक्तिहरू निरन्तर तथा नियमित रूपमा प्रशिक्षित र अद्यावधिक भइरहन सक्छन्।

ईन्जिनियरिङ स्टाफ कलेज स्थापनाको औचित्य

नेपाली जनताको आजको चाहना भनेको आर्थिक उन्नति, राष्ट्रिय समृद्धि, उँचो स्वाभिमान हो। ३ तहको सरकार, विकेन्द्रीकृत विकास बजेट र तदनुरूप पूर्वाधार विकास निर्माणको वातावरण बनिसकेको हालको अवस्थामा दिगो शान्ति स्थापना गर्नु, संविधान कार्यान्वयन गर्नु, राष्ट्रिय स्वाभिमानको रक्षा गर्नु, न्यायपूर्ण विकासको अग्रगामी मार्ग तय गर्नु, अन्तर्राष्ट्रिय स्तरका भौतिक संरचनाहरू निर्माण गर्नु जस्ता अहम् दायित्वहरू हाम्रा काँधमा छन्। यसका लागि अब बढी श्रृजनशील भई नेपाली ईन्जिनियरिङ पेशाकर्मी समुदायलाई सक्षम नबनाई हाम्रो उक्त दायित्व पूरा गर्न सम्भव छैन। नेपालले विकास व्यवस्थापनमा सामना गर्नु परेका प्रमुख समस्याहरू मध्ये वार्षिक बजेटले निर्दिष्ट गरेको पूँजीगत खर्च ज्यादै न्यून हुनु पनि एक हो, जसको अर्थ हो आयोजनाको पूर्व सम्भाव्यता अध्ययन, सम्भाव्यता अध्ययन, विस्तृत सम्भाव्यता अध्ययन, कार्यान्वयन र प्राविधिक परीक्षण जस्ता

आयोजना चक्रका हरेक तहमा हाम्रा विकास व्यवस्थापक र अभि विशेषगरी प्राविधिक जनशक्तिले ज्ञान, क्षमता र दक्षतामा सुधारनु पर्ने थुप्रै ठाउँहरू विद्यमान छन् । विकास निर्माण कार्यमा विज्ञ समुह सहित संलग्न प्राविधिक जनशक्तिले योजना निर्माण, प्राथमिकीकरण, छनौट, आवश्यक साधन स्रोतको पहिचान र परिचालन, प्राप्त हक अधिकारको संरक्षण-उपभोग, अल्पकालीन, मध्यकालीन र दीर्घकालीन माग तथा आपूर्तिको विश्लेषण जस्ता विषयहरूमा ईन्जिनियरिङ पेशाकर्मीहरूको हालको ज्ञान, सीप, क्षमता र दक्षतामा उल्लेख्यमात्रामा अभिवृद्धि गर्न अनिवार्य छ, जसको माध्यमबाटमात्र तीव्र आर्थिक विकास र न्यायोचित वितरण सहितको “समृद्ध नेपाल र सुखी नेपाली”को लक्ष्य हासिल गर्न सकिन्छ । देशका सामु रहेका यी विहंगम कार्यभारको सफल नेतृत्व दिन र गुणस्तरीय भौतिक संरचनाहरूको निर्माण र सञ्चालनको सुनिश्चितता गर्न नेपालमा एउटा ईन्जिनियरिङ स्टाफ कलेज स्थापना गर्न आवश्यकता छ । सारमा ईन्जिनियरिङ प्राविधिकहरूको प्राविधिक क्षमता, व्यवसायिक क्षमता, वैयक्तिक क्षमता तथा व्यवस्थापकीय क्षमता अभिवृद्धि गर्न निम्न उद्देश्यहरूका लागि ईन्जिनियरिङ स्टाफ कलेज स्थापना जरुरी छ :

- समयसापेक्ष तथा गुणस्तरीय पूर्वाधार विकासको सुनिश्चितताको लागि आवश्यक जनशक्ति तयार गर्न,
- विज्ञान प्राविधिको विकाससँगै नयाँ तथा आधुनिक आयोजना, परियोजना निर्माण तथा सञ्चालन गर्न सक्षम प्राविधिक जनशक्ति देशभित्रै तयार गर्न,
- राष्ट्रिय गौरव तथा बृहत्तर महत्त्वका ठूला आयोजना कार्यान्वयन गर्न सक्षम विकास व्यवस्थापक र दक्ष प्राविधिक जनशक्तिको दिगो आपूर्ति गर्न,
- नेपालको आफ्नो स्रोत, साधन, र आवश्यकताको आधारमा अन्तर्राष्ट्रियस्तरमा प्राप्त सूचना, ज्ञान, सीप र प्राविधिको उपयोग गर्न सक्ने दक्ष जनशक्ति विकास गर्न,
- नेपालको वस्तु तथा सेवाको उत्पादनलाई थप दक्ष, स्तरीय र प्रतिस्पर्धी बनाई उच्च उत्पादकत्व र उच्चतम प्रतिफल दिन सक्ने बनाउन,
- क्षेत्रीय तथा अन्तर्राष्ट्रिय तहमा भएका ज्ञान, सीप, नवीनतम आविष्कार तथा अनुभवलाई नेपालको आवश्यकता अनुसार प्रयोग गर्न सक्ने बनाउन,
- नयाँ-नयाँ रोजगारीको अवसरको सम्भावना र सिर्जनाको लागि तालिम तथा क्षमता विकासको आवश्यकता पूरा गर्न,

- नेपाल सरकारले अवलम्बन गर्नु पर्ने नीति तथा कार्यक्रमलाई सहयोग पुग्ने गरी ईन्जिनियरिङ क्षेत्रका विविध विधामा अध्ययन अनुसन्धान गर्न,
- देशको लागि आवश्यक मानवीय संसाधन र प्राविधिक जनशक्तिको अल्पकालीन तथा दीर्घकालीन आवश्यकताको अनुमान तथा प्रक्षेपण गर्न,
- नेपालबाट विविध कारणले विदेशिएका नेपाली ईन्जिनियरिङ पेशाकर्मी युवाहरूलाई नेपालमै फर्कन प्रोत्साहन गरी युवा स्वरोजगार कार्यक्रम, बिना धितो ऋणको व्यवस्थामार्फत स्वयम् व्यवसायको सिर्जना जस्ता आकर्षक उपायहरूमार्फत देशलाई औद्योगीकरणतर्फ उन्मुख गराई देशमै रोजगारीको सिर्जना गर्न,
- अत्याधुनिक सूचना प्रविधिमा आधारित ज्ञान, सीप, क्षमताको विकाससँगै औद्योगीकरण र रोजगारीको अवसर तयार गर्न ।

ईन्जिनियरिङ स्टाफ कलेज स्थापनाको विधि

नेपाल सरकारले ऐन तर्जुमा गरी ईन्जिनियरिङ स्टाफ कलेजको स्थापना गर्न सक्ने छ । सो संस्था नेपाल सरकारकै कुनै एक प्राविधिक मन्त्रालयको संरक्षकत्वमा रहने तथा सम्बन्धित सरकारी, गैर सरकारी तथा निजी क्षेत्रको प्रतिनिधित्व गर्ने सञ्चालक समितिको निर्देशनमा सञ्चालन हुने एउटा स्वायत्त र स्वशासित निकाय हुने छ । ऐनद्वारा स्थापित एउटा स्थायी र दिगो ईन्जिनियरिङ स्टाफ कलेज सञ्चालनमा आउनेछ ।

ईन्जिनियरिङ स्टाफ कलेज स्थापनापछि अपेक्षित प्रतिफल

कलेजको स्थापना पछि देशले निम्न बमोजिमको प्रतिफल हासिल गर्ने छ :

- देशको पूर्वाधार विकासलगायत सम्पूर्ण विकास निर्माणका क्षेत्रमा हाल कार्यरत तथा भविष्यमा संलग्न हुन सक्ने सम्पूर्ण ईन्जिनियरिङ पेशाकर्मीहरूको प्राविधिक ज्ञान, सीप, दक्षता र क्षमता अभिवृद्धिको लागि एउटा दिगो र स्थायी संरचना बन्नेछ र नेपाली इन्जिनियरहरू विश्व बजारमा प्रतिस्पर्धि हुनेछन् ।
- राष्ट्रिय र अन्तर्राष्ट्रिय तहमा ईन्जिनियरिङ प्रविधिको क्षेत्रमा भएका नवीनतम

उपलब्धिहरूको बारेमा देशको ईन्जिनियरिङ पेशाकर्मिहरू जानकारी हुनेछन् ।

- देशको “समृद्ध नेपाल, सुखी नेपाली”को राष्ट्रिय सपनालाई साकार बनाउन आवश्यक सक्षम प्राविधिक जनशक्ति देशभित्रै तयार हुने छ, त्यसमा कार्यरत प्राविधिक जनशक्तिले निरन्तर शिक्षा, पेशागत क्षमता अभिवृद्धि, वृत्ति विकास र पेशागत प्रगतिको अवसरहरू देशभित्रै प्राप्त गर्ने छ ।
- देशभित्र कार्यरत प्राविधिक जनशक्तिको सीप, दक्षता र क्षमता अभिवृद्धिको अवसर देशभित्रै प्राप्त हुँदा सोको लागि देश बाहिर जान सक्ने सम्भावित वित्तीय स्रोतलाई कम गर्न सकिनेछ, जसले केहि हदसम्म वैदेशिक मुद्रा सञ्चितिमा सहयोग पुऱ्याउने छ ।
- प्राविधिक जनशक्तिको क्षमता अभिवृद्धिबाट प्रतिस्पर्धी क्षमता र रोजगारी प्राप्त गर्न सक्ने सम्भावनामा वृद्धि हुने, उत्पादकत्व बढ्ने, कार्य-कुशलता थपिने, कामको गुणस्तरमा बढोत्तरी आउने छ ।

अन्त्यमा

विकासका सम्बाहक ईन्जिनियरलाई प्राविधिक दक्षताको साथै, प्रभावकारी सम्वाद, व्यवहारीक एवं व्यवस्थापकीय दक्षता, सामूहिक कार्यकुशलता, नेतृत्व, व्यवसायिक आचार संहिताको पालनालगायत वातावरणीय सचेतनायुक्त ज्ञान जस्ता विषयमा प्रचुर जानकारी तथा अनुभवको आवश्यकता पर्दछ । सैद्धान्तिक ज्ञानका साथै उपरोक्त विषयहरूका बारेमा ईन्जिनियरलाई व्यवहारिक ज्ञान प्रदान गर्नेलगायत कार्य कुशलता एवं व्यवसायमा निपुण बनाउन विभिन्न किसिमका तालिम, परामर्श जस्ता थप क्षमता अभिवृद्धिका कार्यक्रमहरूबाट दिक्षित गर्न सकेमा मात्र मुलुकले दक्ष प्राविधिक जनशक्ति प्राप्त गर्दछ र त्यस्तो जनशक्तिले राष्ट्रिय तथा अन्तर्राष्ट्रिय क्षेत्रमा आफ्नो दक्षता प्रस्तुत गर्ने सामर्थ्य राख्दछ । तसर्थ गुणस्तरीय निर्माणद्वारा दिगो विकासको लक्ष्यसहित समृद्ध नेपाल सुखी नेपालीको सपना साकार बनाउन नेपालमा एउटा छुट्टै नेपाल ईन्जिनियरिङ प्रशिक्षण तथा अनुसन्धान प्रतिष्ठानको स्थापना एवं सो कार्यान्वयनमा नेपाल सरकार, सम्बन्धित निकाय तथा सम्पूर्ण ईन्जिनियर/आर्किटेक्टहरूको सक्रिय चासो र सहयोगबाट छिट्टै नै लक्ष्यमा पुगिने छ भन्ने पूर्ण विश्वास लिएको छु ।

Fundamental of Projects and Project Management: An Overview



 **Prof. Pramod B. Shrestha, Ph.D.***

Introduction

One of the major challenges that confront developing countries and institutions is ensuring that the projects they support are successfully implemented and that the objectives of the projects are being realized.

Managing projects is one of the oldest and most respected accomplishments of humankind. We all stand in awe of the achievements of the builders of the pyramids, the architects of ancient cities, the masons and craftsperson of great cathedrals, mosque and temples, of the might and labors behind the great wall of china and other wonders of the world. Today's projects, too, command our attention. We are impressed as a new school or a new bridge is opened or as a new computer system comes on live. All of these endeavors are 'projects'. Projects create change. It is also limited in time and scope and has mixed goals and objectives. It involves a variety of resources, and is unique. Generally when we talk about projects and project management, we think about techniques and procedures

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(related to project planning, scheduling and project control) rather than management practice.

At its most basic, project management is a simple discipline. It is an effort to achieve a specific objective within a schedule and budget target, which typically cuts across organizational lines and is usually not repetitive within the organization. It is also, in my opinion, the management of the process of establishing the project's objectives and its definition; of assessing it so that it is set up with the maximum chance of being successful technically, commercially, socially, etc. for all its stakeholders it affects; and of accomplishing it efficiently and effectively.

Project management is continually evolving and will continue to gain momentum as a strategic competency and critical business discipline across all industry sectors. Organizations are increasingly adopting a project-based approach and there is no indication that this trajectory will waiver or lose momentum in the next decade. Project based work is now business as usual for many traditional business units. The world of work has changed and so too must the discipline of project management. In times of social, environmental, economic and increasing technological changes, project management must evolve and adapt to changing conditions if it is to remain relevant and meet the evolving demands of future focused organizations. Management by projects has become a powerful way to integrate organizational functions and motivate groups to achieve higher levels of performance and productivity.

Projects – Their Nature and Purpose

The first step in our journey to develop successful project management skills is to take a close look at what we mean by a “project” and also look at its nature, characteristics and variety.

Project – A Definition

The simplest definition of a project is ‘something which has a beginning and an end’. However, this definition needs some qualification. Some of the definition of projects are:

An endeavour in which human, material and financial resources were organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives (Turner, 1993).

A Human endeavour which creates change; is limited in time and scope; has mixed goals and objectives; involves a variety of resources; and is unique (Andersen, Grude, Hang and Turner, 2019).

A project is a sequence of activities which are:

- Connected
- Conducted over a limited period of time
- Targeted to generate a unique but well defined outcome.

(Baguley, 2000)

A project is a unique complex of activities aimed at achieving a jointly predetermined, unique result that must be realized with limited means (Kor and Wijnen, 2010).

A project can be defined as a “non-repetitive activity” with the following unique characteristics:

- It is goal oriented – it is being pursued with a particular end or goal in mind;
- It has a particular set of constraints – usually centered around time and resource;
- The output of a project is measurable;
- Something has been changed through the project being carried out (Maylor, 2020)

Project and project management includes planning, organizing, directing and controlling activities in addition to motivating what is usually the most expensive resource on the project - **PEOPLE**

Planning involves deciding what has to be done, when and by whom. The resources then need to be organized through activities such as procurement and recruitment. Directing their activities towards a coherent objective is a major management role. The activities also need controlling to ensure that they fit within the limits (for example say – financial) set for them.

From all the above definition, we can identify that a "*project*" has:

- an objective (to create or achieve something)
- some resources (manpower, management, physical resource)
- a budget – the estimate of resources needed
- a schedule or time-span from identification to achievement of the objective

Similar a project:

- is a unique scope of work
- is undertaken using a novel organization
- achieves beneficial change

A project therefore:

- carries considerable uncertainty and risk
- requires the integration of the novel organization
- is subject to constraints of time, cost and quality

In summary we can define that all projects:

- involve people
- are unique
- are concerned with change
- have defined outputs, outcomes and end-points
- use a variety of transitory resources

Having defined a project and outlined the role of management in this environment, we can now examine more closely what a project involves.

Project – The Key Dimensions

Generally we think about a project only in terms of its outcome or performance. For example, we might think of a project involving the construction of a house only in terms of the outcome of a new house being built. However, the outcomes of this and indeed all projects have other dimensions.

The definition of a project given above implies that the delivery of the project's purpose requires the management of five project dimensions (objectives), not just one or three (Turner, 1993). They are:

- Managing scope
- Managing organization
- Managing quality
- Managing cost
- Managing time

Fig (1) depicts the five key dimensions of project and its management:

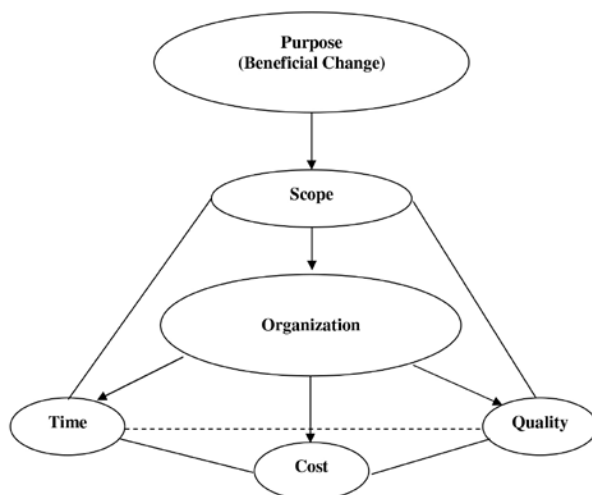


Fig (1): The Five Dimensions of Projects (Turner, 1993)

The traditional project management approach focuses only on the time and cost dimension of a project. However, at the end of the twentieth century, the procedure and influence of the Quality Revolution with its accent on the provision of total consumer satisfaction means that we now have to add the “Quality” and “Scope” dimension of the project outcome. The term “performance” is sometimes used to cover scope and quality.

These five dimensions of time, cost, scope, quality and organization are the key dimensions for all projects. As such they must be:

- # clearly defined at the beginning of the project
- # monitored throughout its duration
- # carefully managed and controlled at all times.

Indeed, the importance of these factors is such that it can be

argued that the failure to define all five at the beginning of the project will result in an unsuccessful project.



Fig (2) - The scope/quality/cost/ time diamond

As indicated in Fig (2) all these dimensions are both connected to and dependent upon each other.

For example, a shortage of time left to complete a project might be compensated for by taking on extra labour – at additional cost – or reducing the work content by changing the scope. Similarly, an increase in quality dimensions of the project may require increases in both time and money to compensate.

The Management Processes

Tackling the topic of the management of projects is not easy. Projects are difficult to study for several reasons. They are generally multi-organizational and hence often involve sensitive issues that many people are reluctant to have publicly discussed; they are often of long duration and there are multiplicity of topics or issues to be handled. We have also seen good projects around the world that were technically excellent, fall flat in the

mire of political intrigue or social insensitivity. It is often a case of good idea, but lousy execution.

To achieve each objective requires the use of management processes that address the unique and transient nature of projects. According to Turner (1993) there are two views on management processes.

The problem-solving cycle addresses the uncertainty, viewing the projects purpose as a problem, and applies standard management processes (like Logical Framework approach) for problem solving. A classic approach uses four basic steps: plan, organize, implement and control.

We can also apply Deming PDCA cycle for project management. The means by which constant improvement is achieved by the PDCA cycle (applied to project management) is shown in Fig 3.

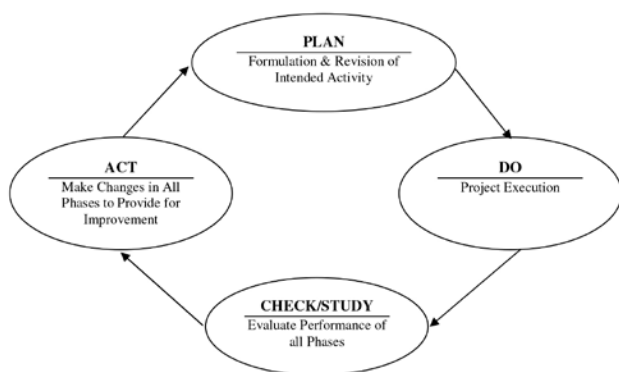


Fig 3: Deming PDCA Cycle for Project Management

The planning stage involves the formulation and revision of the statements of intended activity, whether formalized or otherwise. The doing is the time when the project is carried out (the direct value-adding phase). The check/study phase involves a critical appraisal of both the project output (was a good result achieved?) as well as the process (was it carried out

as well as it could have been?). The act stage is that phase when the whole project process is considered to see how the lessons learned and gleaned from the review could be channeled back to the people involved in the process.

The project management life cycle addresses the transience of projects directly. Having a beginning and an end, project go through several stages of development. There are many versions of the project life cycle. The simplest has four basic stages (Turner, 1993):

1. Germination (conception)
2. Growth
3. Maturity
4. Death

It is also evident that however well-defined the desired outcomes might be, the project process itself is, like all human endeavours, subject to change, growth and decline. This pattern of growth and decline is a familiar one which we see in the life cycles of many organic systems or organisms.

Germination (Conception)

During this stage the project is identified, its feasibility reviewed and initial estimates of cost generated. This stage will also involve an initial definition of performance and time. The end of this stage, during which the project is compared with other projects or standards of performance, will be marked by a decision to implement the project or not. The decision to implement will then lead to the next stage of growth.

Growth

In this stage the detailed design of the project outcome is developed and decisions are made about who will do what and

when. Cost and time estimates are also refined. Both this and the earlier stage involve a relatively low, though accelerating pace of activity.

Maturity

This is the stage in which the planned work takes place. It is also the stage with the highest activity rate and as such it requires effecting monitoring, control and forecasting procedures which will tell the project manager and the staff what has or has not been done or spent, what ought to have been done or spent, and what will need to be done or spent in the future.

Death

This stage involves a slower pace of activity, involving the review and audit of the project and, ultimately, the break-up of the project team.

The Project as a Conversion Process

This approach is also known as “System Approach”. The project is viewed as a conversion or transformation of some form of input into an output. As Fig 4 shows, the inputs are some form of “want” or “need” which is satisfied through the process. The project will take place under a set of controls or constraints – those elements generally from outside the project which either provide the basis for any assumptions, or limit the project. The mechanisms are those resources that make the transformation process possible.

The above consideration provides the most basic model of a project. The nature of the transformation process will be determined by the environment in which it is taking place.

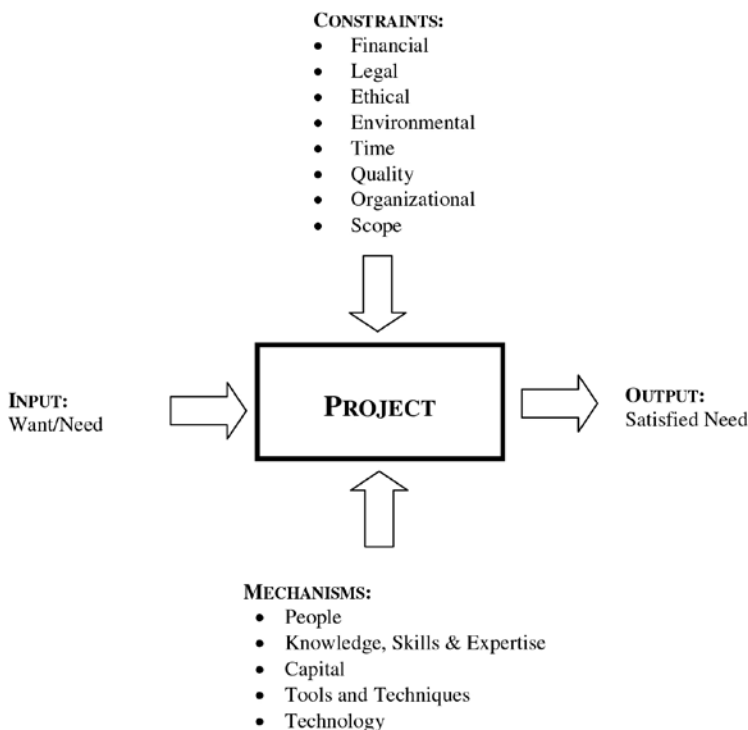


Fig 4: The project as a Conversion Process (Maylor, 2020)

PROJECT MANAGEMENT FRAMEWORK

The fundamental character of the above concept is adopted from the Logical Framework Approach (LFA) model. As a starting point in the Logical Framework Approach, we first have to recognize that there are four basic levels of responsibility:

- 1. INPUTS** = the resources we consume and activities we undertake.
- 2. PROCESS** = where the inputs are processed to produce an

outputs (products or services)

3. OUTPUTS = the thing we, as good managers, are committed to produce. These must be stated as results. If we fail to produce those results, then the burden of proof is on the manager to "show cause" as to why he or she failed.

4. PURPOSE = the reason we are producing the outputs: the higher level objective that causes us to invest in producing outputs.

Having outlined the basic management hierarchy of objectives, let us now introduce the basic scientific method:

All human activities are uncertain. Therefore, we view our project as a set of interlocking hypotheses: if inputs, then outputs; if outputs, then purpose.

Note that now we have introduced the concept of probability (uncertainty) of success in our hierarchy of objectives. One of the common definitions of uncertainty postulates that uncertainty and the availability of relevant information are directly correlated: in the absence of information uncertainty is high – when information is made available, uncertainty decreases.

Now, let us introduce the another viewpoint which is important to the Logical Framework Analysis – the System Analysis – a requirement that we have not specified a system until we have specified the relationship this system bears to some larger system. To do this, we add to our four – level (inputs – process - outputs – purpose) objectives hierarchy a fifth level, called "Goal".

A system design algorithm as applied to LFA can be represented by the following simple equation:

$$Y(t) = f[X(t), E(t)]$$

Where 'f' represents the system transfer function (as in control system theory), it tells us how the system transforms all Inputs – purposeful as well as environment – into outputs.

In this algorithm:

- X (t) represents the set of inputs to the system;
- Y (t) represents the set of outputs from the system;
- f represents system parameters;
- E (t) represents the environmental parameters; and
- t represents any independent variable.

The above equation indicates that the sets of outputs from the system is a function (f) of the inputs to the system and of the environment in which the system operates. It is important to note that the relationship between the system and the environment (the bigger system) convey the following important attributes:

- The environment is also affected (directly or indirectly) by the outputs of the system; and
- The environment, hence, has a dynamic influence on, and is also influenced by the system.

The external factors which are outside the direct control of the project can also significantly influence the success or failure of the project. Given the many uncertainties in the connection between purpose and goal, we also view this final element in our LFA logic as a testable hypothesis (*if purpose, then goal*).

It is important to note that the relationship between the levels of objectives is not random or accidental; there is a definite causal relationship. When we identify our purpose, for example, and then define the outputs we will need to achieve that purpose, we are in effect saying: "If we can produce these outputs, then

we should achieve this purpose". In other words, we select these outputs because we believe they can cause the purpose to happen. We are therefore making a hypothesis that *"if outputs - then purpose"*. The logic is – IF and THEN

The concept of linked hypothesis is very important in the project management framework. A hypothesis is defined as a predictive statement about a causal relationship that involves uncertainty. A simple example of this is the prediction that if one boards one's regular morning bus by 8 o'clock, then one will arrive at one's office on time. However, it is not possible to have 100 percent certainty that this will happen because many things could happen between boarding the bus and arriving at the office, such as the bus breaking down, or being involved in an accident.

When we design a project using this framework, we have to make a series of predictions which we usually call hypotheses. These are:

• IF the inputs are managed properly,

THEN the outputs will be produced.

• IF the outputs are produced,

THEN the purpose will be achieved.

• IF the purpose is achieved,

THEN this will contribute to achievement of the goal.

We assume that:

- If the inputs are available, then the activity will take place.
- If the activities take place, then the outputs will be

produced.

- If the outputs are produced, then the purpose will be achieved.
- If purpose is achieved, in the long run this will contribute to the fulfilment of the goal.

The hypotheses as shown here are over-simplified. Each time we make some hypotheses, we have to accept that there will be a degree of uncertainty. In general, the amount of uncertainty increases as we reach higher up the project hierarchy of objectives. It therefore becomes very important to clarify the nature of uncertainty so that we can select a design that has the highest probability of success. This is done by including in our project design, additional factors necessary for achieving success but which are beyond our control. We call these additional factors "assumptions". For example, when one predicts that one will get to the office on time by boarding one's regular bus at 8 o'clock, one assumes that the bus will be in good mechanical condition, and there will be no accidents.

Assumptions reflect our recognition that there are factors beyond our control that are necessary for successful achievement of objectives at all levels of the project. In the previous example of catching the bus to go to the office in time, we can control getting up on time, having breakfast and getting to the bus-stop for ourselves. We cannot, however, control the traffic or ensure that the bus company keeps its buses in good running order. So by identifying our assumptions, we have expanded our original hypothesis statement to include the specific nature of the more important uncertainties that could affect that hypothesis.

Having once identified the assumptions, we can then try to deal with them in such a way as to increase our probability of success and consequently our confidence in our project design.

The question of assumptions can be the critical factor in projects and project management. The important point is that we must define, at any one level, all the necessary and sufficient conditions (both within our control – the central hypothesis – and outside of our control – assumptions) that must be in place for us to achieve the next level objective.

Assumptions are useful not only during the design stage of the project but also during the course of the implementation of the project and its evaluation. Once the project begins, the project manager should monitor the assumptions regularly to assess their continuing validity. Assumptions are also important during monitoring and evaluation because their examination can provide useful insight as to why the project has or has not succeeded on achieving its stated objectives.

PROJECTS AND PROJECT MANAGEMENT IN THE NEW DIGITAL WORLD

Projects touch all our lives, in working and social environments. In this new environment, we manage change through projects. One of the major challenges that confront developing countries and institutions is ensuring that the projects they support are successfully implemented and that the objectives of the projects are being realized. Project-based management has become the new general management through which organizations respond to change to develop and exploit markets ahead of its competitors, and hence project management is a skill that all managers need in their portfolio, alongside more traditional disciplines.

Projects come in many guises. Big or small, projects are characterized by their temporary nature, which makes it virtually impossible to fall back on existing tools. They are non-traditional, complex and unique. A project therefore

carries considerable uncertainty and risk, and is subject to constraints of time, cost and quality. The management of projects is a process, by which beneficial change is defined and implemented. Since projects are innovative processes for development that require multi-disciplinary skills to manage, there is need for trained and competent staff who can handle projects with confidence and ease.

Today we have come to a critical tipping point, where the information communication technology (ICT)-fueled digital economy is taking off in an exponential way. We have also come to recognize that in this Fourth Industrial Revolution (4th IR) which will fundamentally change the way we live, work, and relate to one another. This transformation is not defined by any particular set of technologies, but rather by a transition to new ecosystems built on the infrastructure of the digital revolution. The 4th IR is seeking to shape and design these new systems by emphasizing and scaling cross-sector and cross-geographic collaborations.

We are at the beginning of a global transformation that is characterized by the convergence of digital, physical, and biological technologies in ways that are changing both the world around us and our very idea of what it means to be human. The changes are historic in terms of their size, speed, and scope. This transformation—the Fourth Industrial Revolution—is not defined by any particular set of emerging technologies themselves, but rather by the transition to new systems that are being built on the infrastructure of the digital revolution. As these individual technologies become ubiquitous, they will fundamentally alter the way we produce, consume, communicate, move, generate energy, and interact with one another. And given the new powers in genetic engineering and neuro-technologies, they may directly impact who we are and how we think and behave. The fundamental and global nature of this revolution also poses new threats related to the disruptions

it may cause—affecting projects and project management and the future of work as well as social value systems and ethical frameworks.

In a next step, two sets of questions will require attention if the digital revolution is to be shaped in a way that can bring broad-based improvements in projects and project management, making our societies more prosperous and inclusive.

First, there is a need to measure the impact of technologies beyond productivity and innovation, ensuring that the digital revolution is also socially beneficial and sustainable in the area of projects and its management. In assessing the impact of the unfolding digital revolution, parts of the picture are currently missing. Ideally more mechanisms would be captured by which new technologies enable and empower people in projects and project management and to more systematically keep track its impact. What is measured matters for the way trust in new technologies is built and the way the emerging Fourth Industrial Revolution can be shaped.

Second, new indicators could usefully be introduced to better map various project benefits and is concerned with the points of contact between project and beneficiaries, where project activities encounter the population's perceptions and expectations. Physical and financial monitoring generally measures a project's provision and delivery of services and inputs. But in any development project we also need to know whether their services are being accepted and how they are being integrated into the systems.

A concept of benefit monitoring is accomplished by collecting the data according to the criteria - indicators framework. Choosing the proper indicators to be measured is crucial to setting up effective benefit monitoring system. Inappropriate indicators can doom a benefit monitoring and evaluation system. Once the types of indicators have been defined,

several operational criteria should be applied in choosing the actual indicators. The measurements should be selected with implementation in mind and should be developed according to the basic concepts of speed, regularity, flexibility, and mobility. Systematic data sources for these indicators will need to be identified.

Conclusion

This paper has provided an overview of the environment in which a project operates and some of its structures which can be applied to understand the nature and context of project and project management. Whenever we start any project, the first question of “So where do I start my project?” arises regularly. The first thing to consider is the strategy for the project. This determines the priorities for what follows and sets the objectives by which project performance will be assessed.

Having set the strategies, the next step is to model (plan) the system that will be used to deliver the desired outcome. The next phase is the execution phase where the fundamental question is “How the project should be managed on a day-to-day basis?” In bringing together the resources to execute the plans, the project manager has to be in a position to make objective decisions about the scope, quality, time and cost of the project.

The last phase is the evaluation phase where assessment of the project and its outcomes are made and feedback provided for future projects.

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Television Broadcasting Technologies in Nepal



👉 Anup Nepal*



Subodh Nepal**

Introduction

Television broadcasting is the distribution of television program content to public users using a telecommunications network. Until the mid-1980s, television programming in most countries of the world was dominated by a small number of terrestrial networks but the television broadcasting field has tremendously developed these days. The TV broadcasting technology evolved from the small terrestrial networks has transformed into new technologies like Satellite Broadcasting, Cable TV broadcasting, Digital Terrestrial Broadcasting, Multichannel Multipoint Distribution Service, Internet Protocol Television (IPTV), etc. This article aims to elaborate on the technological trends of broadcasting from past to present emphasizing the key technologies with greater impacts in the development of broadcasting.

Brief History of Television Broadcasting in Nepal

In Nepal, television broadcasting started in 1985 when Nepal Television started its UHF/VHF transmission installing a

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single transmission site at Phulchowki (Nepal Television, 2020). The broadcasting included limited programs and was restricted to the transmission within a limited Line of Sight (LOS) region. This limited area transmission had an end in 2002 when Nepal Television started the satellite transmission of its television content. Till then the electricity and television sets were being easily available even to the remote areas of Nepal. By the use of satellite stations, the television signal became readily available to most of the places in Nepal. Another key transformation of the television watching trend in Nepal is the breakthrough of the cable network distribution system. Different private cable operators built their own distribution network to carry larger number of television channels initially to the main urban areas through the use of coaxial cable. These cable-based transmission system not only used to broadcast Nepalese channels but also to broadcast different foreign (especially Indian) television channels making the TV broadcasting more diverse, intense, and easily available.

In order to encourage the involvement of private sectors in transmission and content production for television, the government of Nepal introduced the broadcasting rules and regulations. After the rules and regulations were in acted, the huge participation of private sectors (like Kantipur television and Image televisions) had greatly changed the broadcasting scenario. Different terrestrial television launched their transmission from different part of the countries using VHF/UHF analog broadcasting. At the same time, some big houses also started to broadcast their television signal through satellites, which then received by cable distribution companies and disseminated it to end consumers through coaxial cable. At the same time government owned Nepal Television also extended its coverage by adding more transmission sites and more channels to be distributed using satellite and terrestrial channel. Later, it became more economic and cost effective

for the operators to choose cable networks to distribute their television signal than other mediums like terrestrial channel but due to proper lack of regulation it was very tough thing to be implemented. In order to address this problem (especially for private television operators), government of Nepal introduced provision of cable television i.e., the television using the cable networks as a distribution media.

In the year 2010, the satellite broadcasting of television signals was very popular since the satellite transmission was already digitized but the terrestrial transmission was still analog. Also, due to the large coverage of satellite broadcasting including urban, suburban, and rural areas, two operators established their distribution network for satellite broadcasting of multiple (national and international) television channels. By then, most of the television channels were distributed using cable networks (coaxial and optical fiber) and satellite point-to-multipoint networks. Most of the operators who were licensed to have terrestrial transmission shifted their transmission mode to either cable or satellite. So many wireless frequency channels in the VHF and UHF bands were unused.

As per the International Telecommunication Union's (ITU's) guidelines, the Government of Nepal introduced modality for the graceful transition of analog-digital terrestrial transmission of TV into the digital transmission of television signals (ITU, 2012). This transition process commenced in 2012 and took a long time to completely switch analog signal transmission off and digital signal on. During this process, the Government of Nepal vacated all the previous UHF band allocated to analog TVs into the band to be used for digital terrestrial transmission and allocate some additional spectrum from the UHF band for the digital terrestrial transmission of the television signal.

In the meantime, the traditional analog based cable distribution needed to be digitized since digital technology was being widely

spread all over the world. This transformation was really a great challenge for all of the broadcasting stakeholders (regulators, cable distributors, channel distributors, advertising agencies, content producers, television operators and consumers). This is because it demanded a huge of investment for replacing the analog based headend, transmission media and supplying digital set-top box to each and every consumer home. For regulators, they required to provide proper rules and regulations, monitor the implementation as per the rules, and update the rules after analyzing the demands and needs of the consumers, operators and other stakeholders. This whole process went on for a long duration till it was fully implemented.

Due to massive digitization of technologies around the world, the television transmission also transformed into complete digital era in and around 2020 in Nepal. All the analog terrestrial channels were converted into digital terrestrial channels. Cable operators upgraded their classical approach of signal distribution into digital platform by using digital technologies and optical fiber. At the same time the internet penetration of the country was highly increased through the use of latest technological developments like 3G, 4G, FTTH, Wi-Fi, etc. The advancements in internet, data rate, video compression technology, robust transmission media, studio equipment, cameras, recording media made the television broadcasting technology highly emerging and developed. Currently, there are digital cable operators, terrestrial distribution operators, IPTV operators, Cable TV operators, Satellite broadcasting operators, MMDS operators operating national, regional or local basis. Nepal Television has already started its additional regional channels from Itahari and Kohalpur stations and is planning to add more channels and transmission sites.

Key Television Technologies in Nepal

In Nepal, has various television technologies in use from its initiation to present. The transition in technologies emerged with the technological advancements, national and international trends, public interest in television, and market capabilities in Nepal. The major broadcasting technologies that were used and are being used are listed below and explained in brief:

1. Analog Terrestrial Broadcasting:

Analog terrestrial television is a type of television broadcasting in which the television signal is transmitted by radio waves (using analog modulation techniques and analog transmission format) from the terrestrial (Earth-based) transmitter of a television station to a TV receiver having an antenna. During the initial phase of Nepal Television, VHF and UHF frequency bands were used to transmit analog television. After the privatization in television broadcasting, there were almost 30 analog terrestrial television license holders in Nepal. Due to their requirement for the large number of high-power transmitters at different rural locations in the country and lack of proper and sufficient coverage, this type of transmission no longer used by private sectors but still in use in case of government owned television. However with the emergence of digital technologies, such system of broadcasting is no longer in exists.



Figure 1: UHF transmitter used for Analog terrestrial transmission

2. Digital Terrestrial Television Broadcasting (DTTB):

Digital terrestrial television broadcasting has brought strikingly higher quality and functionality to television broadcasting, and it has also promoted the effective use of radio frequencies as a public resource. In this technology, digital modulation techniques are used for the transmission of television signals. It requires a set-top box to be connected to the traditional television receiver as shown in the figure below. There is a number of DTTB standards that define the predefined standard and properties for the implementation of the system. The standards are DVB-T (Digital Television Broadcasting-Terrestrial) used in Europe, ISDB-T (Terrestrial Integrated Service Digital Broadcasting) used in Japan, ATSC (Advanced Television Service Committee) used in America, DTMB (Digital Terrestrial/Television Multimedia Broadcasting) used in China. Nepal uses the DVB-T standard for the implementation of DTTB. Nepal Television has already completed the transition process of Analog to Digital television by implementing DVB-T2 (second generation DVB-T) systems.

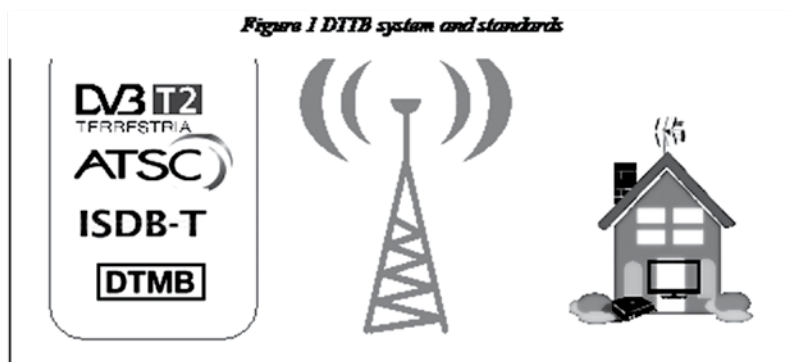
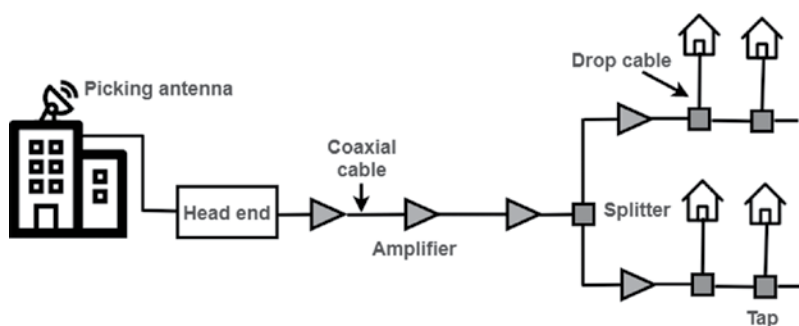


Figure 2 DTTB system and standards

3. Traditional Cable TV Network

This network initially began to broadcast video signals to the locations with poor or no reception. Traditional Cable networks are also called community antenna TV because this antenna is present at the highest level of the building to receive signals from the TV stations then distribute these signals via coaxial cables to the community. Modern cable television, however, does offer several advantages over the original analog over-the-air television broadcasts. One of the first advantages addressed by cable TV systems was better reception. The following is the schematic diagram of the traditional cable TV network. The Coaxial network can be replaced by Hybrid Fiber-Coaxial Network. In Nepal, till about three years ago, many cable distributors were operating at national, regional, and local levels. But due to government policy of conversion of analog cable television into a digital system, these cable operators transformed their network in digital transmission. A large portion of the population used this form of TV reception before it is digitized. This distribution medium carried almost all of the Nepali channels as well as foreign channels through it.



*Figure 3 Traditional Cable TV network
(Cable TV Networks, 2021)*

4. Digital Cable TV network:

This is the latest television distribution technology that accumulates the digital television contents (channels) from different media and encodes, modulates them digitally. The digitally encoded signal is combined with data from SMS (Subscriber Management System, CAS (Conditional Access System) and transmitted through a robust transmission medium. The digital composite signal is then received, decoded at the customer premise through the use of a Set-Top Box. Digital cable television offers several advantages over analog cable television broadcasts. The advantages are: 1) Consumer can have a better quality of television signal like (SD/HD/UHD/4K/8K), 2) Due to better compression technologies consumer can receive a larger number of channels with their interest and selection, 3) consumer can have different packages of the channel with different cost, 4) On-demand programs can be transmitted. And most importantly the same network can be used to distribute and receive the internet data very effectively so that consumers can have both internet and TV signal with high quality. The figure below shows the basic network diagram for the digital cable TV system.

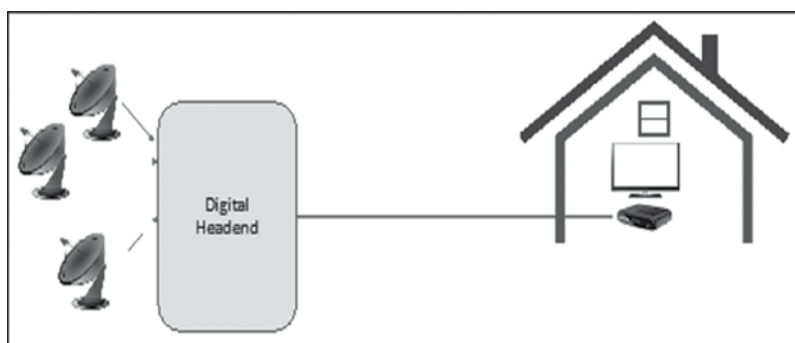


Figure 4 Simple Network for Digital Cable distribution

5. Satellite Broadcasting:

Satellite broadcasting is a system of content distribution using broadcast signals relayed to and from communication satellites, which are then received by parabolic antennae better known as satellite dishes. A satellite receiver decodes the incoming signals and presents them to the user through standard television. The signals coming in are encoded and digitally compressed so as to minimize the size and so that the provider can bundle more channels into the signal. It has all the facilities that are provided by any other digital television system. The benefit of satellite broadcasting as compared to digital cable is that it has better coverage regions. But the main drawback being signal fading and delay due to wireless transmission to and from the satellites. In Nepal, there is only one operator for satellite broadcasting now.

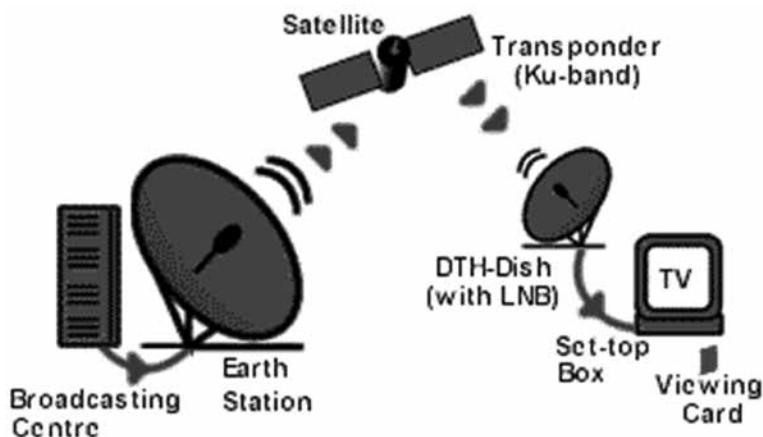


Figure 5 Satellite broadcasting system (DTH) (WINEFASER, 2018)

6. Internet Protocol based TV (IPTV)

Internet Protocol television (IPTV) is the delivery of television content over Internet Protocol (IP) networks in contrast to delivery through traditional terrestrial, satellite,

and cable television formats. Unlike downloaded media, IPTV offers the ability to stream the source media continuously. As a result, a client media player can begin playing the content almost immediately (Wikipedia, 2017). In Nepal, there are few numbers of IPTV providers currently providing their services in different regions of the country.

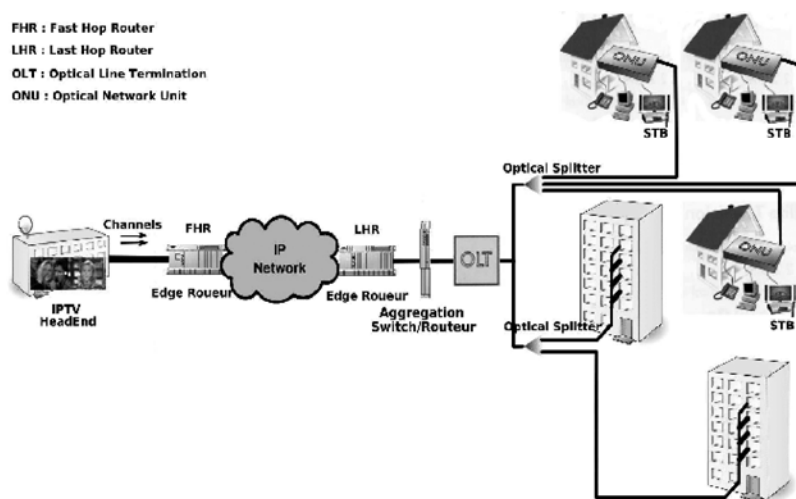


Figure 6 Typical IPTV architecture (Mounir Sarni, 2009)

7. Multichannel Multipoint Distribution Service (MMDS)

It is a wireless broadcasting technology used to distribute television signals to households, used for an alternative method of cable television reception. Recently, this kind of television distribution is used terrestrially and via satellites. In Nepal, there is one operator currently delivering this service in the UHF band. It uses the DTTB technology to distribute the multiple television channels to the consumers. Similar service of distribution of television channels is also provided by two more operators but they use satellite Ku-band frequency as a wireless media. Television users use terrestrial or satellite

antennas and set-top boxes to receive such kinds of television signals.

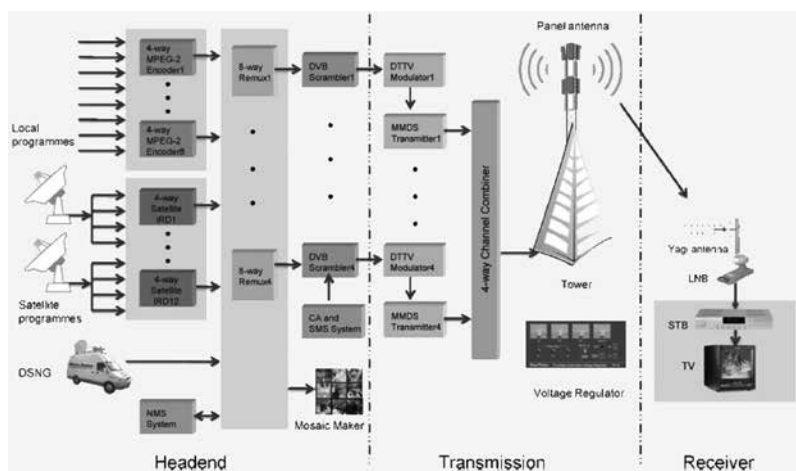


Figure 7 Typical architecture of MMDS system (Horizon, n.d.)

Conclusion

In Nepal, though the television history is of very short, it has greatly transformed in terms of technologies used, the quality of content based on the public interest. These days, the habit of watching television is changing due to the digital convergence and availability of other IP platforms. This article tries to accommodate the brief history of the television industry in Nepal. It also attempts to highlight some of the broadcasting technologies used in Nepal from past to present.

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Necessity of Fecal Sludge Management in Nepal



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Fecal sludge management (FSM) is the collection, transport, and treatment of fecal sludge from pit latrines, septic tanks, or other onsite sanitation systems. Fecal sludge is a mixture of human excreta, water and solid wastes (e.g. toilet paper or other anal cleansing materials, menstrual hygiene materials) that are disposed of in pits, tanks or vaults of onsite sanitation systems. Fecal sludge that is removed from septic tanks is called septage

FSM is necessary in densely populated areas where a proportion of the population is not connected to a sewerage network, and the covering and rebuilding of pit latrines is not possible. This is the case in most urban areas in developing countries, but such services are also used in developed countries where sewerage systems are unavailable. FSM services are usually provided by formal and informal private sector services providers, local governments, water authorities, and public utilities. However, in many developing countries FSM services are often unavailable, or if they are available are

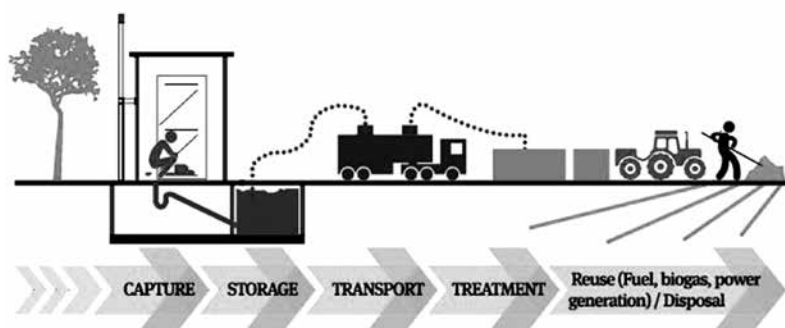
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often informal, unregulated, unhygienic and unsafe. This can lead to surface water and groundwater pollution, the spreading of pathogens into the environment, and adverse public health impacts. It can also result in unreliable services with relatively high costs to the households, which need them.

Fecal sludge collection services can be made available on a scheduled basis or on a call-for-service basis (also known as on-demand, on-request, or non-scheduled services). The collected fecal sludge may be transported to treatment plants using a vacuum truck; a tank and pump mounted on a flatbed truck; a small tank pulled by a motorcycle; or in containers on a handcart. Mobile or permanent transfer stations can be used to improve the efficiency of fecal sludge transportation by transferring the waste to larger tankers for haulage to treatment. The wider use of multiple decentralized sludge treatment facilities within cities (to avoid long haulage distances) is currently being researched and piloted.

The collected fecal sludge should preferably be processed at dedicated fecal sludge treatment plants, or co-treated with sewage in municipal sewage treatment plants, where these plants are particularly designed take such additional load, and facilities to separate liquids and solids are available. A variety of mechanized and non-mechanized processing technologies may be used, which could include constructed wetlands, anaerobic digestion, waste stabilization ponds, etc. The treatment process can produce useful products such as treated effluent that can be used for irrigation and treated solids, which can be composted to apply as a soil conditioner or used for various other uses such as production of biogas, charcoal, biodiesel, powdered industrial fuel, etc., and even to generate electricity. Historically, the term night soil was used for fecal sludge. Resource recovery from fecal sludge can also be for building materials, protein, animal fodder, and water for irrigation.

Sanitation Value Chain



Adapted from Global Health Hub, 2012 .

In 1990, only 6% of the households in Nepal had toilets. The sanitation coverage accelerated and reached almost 87% in the country (2011). Nepal undertook a rapid and effective rapid sanitation movement hinged on community awareness and participation, which was highly successful and as a result the country was declared an Open Defecation Free (ODF) area on 30 September but, this is not the end of the sanitation story. Declaration of the ODF status has posed new set of second-generation challenges, which demand a systematic and much higher level of planning and interventions. Nepal's rapid rate of urbanization has made it more complex to provide sustainable facilities along the value chain of FSM treatment. Although the ODF status implies that most of the fecal matter is contained and stored inside onsite sanitation facilities, in non-sewered areas, the same is not true when it comes to addressing the emptying, transport and treatment of the stored fecal sludge. With rapid urbanization and population growth, the haphazard disposal and discharge of the fecal sludge in open land, forests and rivers are becoming more frequent. These activities have caused serious health issues and imposing negative consequences on the environment. So in fact, the realization of benefits of the ODF status is only fractionally realized. This situation is not

much different from open defecation.

Census data of Nepal 2011 shows that 70% of the toilets are connected to on-site sanitation system whereas the remaining 30% to off-site sanitation systems, A follow up study by CBS, 2012 shows that though there have been some development in the conventional treatment and management of wastewater but fecal sludge treatment has not yet received adequate attention. This is relatively a new but a growing concern that must be addressed to achieve safe sanitation for urban areas in Nepal.

Improper faecal sludge management at urban centers is a major bottleneck to achieve the total sanitation target of the country and the country's SDG commitments to achieve by 2030. Some research and studies have also been carried out regarding technical, economical and institutional aspects of FSM in Nepal. The wastewater conveyed through offsite sanitation systems are partially treated whereas 170000 cubic meters of faecal sludge produced annually from existing on-site sanitation systems in the valley (ENPHO, 2014) is being discharged in water bodies by desludging vehicles without any treatment. To meet the need of sanitation demand Asian Development Bank (ADB) sanctioned the loan for sewage but there are no funds currently available for the FSM program. Therefore, it has become necessary to develop the faecal sludge management (FSM) program in combination with sewerage systems to achieve citywide inclusive sanitation.

Recently, an independent study was conducted by Society of Public Health Engineers Nepal (SOPHEN) in Eastern Nepal; Mithila municipality, Janakpur Sub-metropolitan city and Bardibas municipality, and Western Nepal; Putalibazaar Municipality, Beni Municipality and Pokhara Lekhnath Metropolitan City, which shows that in the Eastern part of the country, the private operators practice regular emptying of the on-site sanitation systems however the emptied sludge

being disposed off in the forests, fields, and water bodies and sometimes used as compost manure in some areas. It was also revealed that most of the time municipal authorities are not aware of fecal sludge disposal facilities and arrangements, or tend to turn overlook to the problem. The key reasons are that the municipalities fail to find available land, lack policies and laws as well and only limited capacity on Fecal Sludge management has hindered the proper utilization of the budget allocated by the Government of Nepal. In the western Nepal, waste management is more inclined towards properly addressing the solid waste management, which is often silent about FSM. Challenges are similar in rest of the country. However, municipalities in Western Nepal have expressed willingness to collaborate with private sectors/ NGOs and other concerned authorities to manage their faecal sludge and wastewater along with the solid waste for effective results.

Several studies conducted in the region has shown the need of a crucial intervention for safe excreta management for sustainable sanitation. Safe excreta management includes safe collection, periodic emptying and transportation for adequate treatment with reuse/ disposal options. However, in most part of the country sanitation is limited to toilet construction only. A significant number of containments have been constructed during ODF campaigns, and desludging service providers exist largely in urban areas, which are unregulated and unorganized. However, faecal sludge treatment plants are very limited in number and haphazard disposal of emptied faecal sludge still remains to be predominant. Thus demanding integration of faecal sludge management in the planning along with other urban services to safeguard the environment and water resources of that area. While the problem is multifaceted, an overall conducive environment to deliver improved wastewater and FSM services mainly for urban areas in Nepal needs to be established urgently.

The formulation of clear policies, regulations and legal instruments should be expedited up. Awareness activities have to be equally prioritized as well. One good part of the discourse on FSM being the Government of Nepal came up with an “FSM institutional framework, 2074” for regulating the FSM initiatives. Several municipalities within and outside the Kathmandu valley have initiated actions to tackle the issue of FSM, parallelly with wastewater and solid waste management in order to achieve safe and sustainable sanitation, that constructively contributes towards attaining the targets of Sustainable Development Goal 6 to “Ensure availability and sustainable management of water and sanitation for all”. On the other hand, there still are number of municipalities, requiring better understanding on the management of faecal sludge along the service chain (containment, emptying & transportation, treatment and reuse/disposal).

Rigorous efforts to create awareness of the general public on the need to efficiently manage the entire chain of FSM activities and capacity building of key stakeholders are equally necessary. The local, provincial and federal government together should put an effort to prioritize this agenda. There is an urgent need to formulate and enforce FSM policy and regulation. An enabling environment should be established so that all the key actors in the sector can come together to make better use of available resources and avoid duplications. Private parties should be encouraged to come forward for smooth operation of services. Public awareness through outreach campaigns and mass media on the importance of faecal sludge collection, desludging/transportation, treatment and disposal or reuse should also be augmented. Further it is necessary to bring to light that a properly managed fecal sludge is more of a valuable resource than merely a waste product that can provide organic fertilizer for crops as well as water for irrigation and even provide energy as well

Necessity of FSM has been felt and seen across the municipalities of the country demanding a high priority to be accorded by the government. Professionals in the sector need to be developed to meet the increasing demand for designing, constructing and implementing faecal sludge management solutions. And, as sanitation situation and practices are vary across the country, the approach and solutions should be context-specific and impactful.

"Engineering in Archaeology" Restoration of Loh: Degah (Stone Temple) at Kirtipur



 Ar. Er. Shova Maharjan*

Abstract

This article deals with the restoration of Shikhara temple affected by Gorkha Earthquake 2015. Here, I tried to show the linkages between engineering and heritage conservation. It talks about the intangible cultures, followed during restoration work, importance of documentation works, skilled manpower, traditional materials and technologies.

Key words: - Shikhara, Intangible culture, skilled manpower, restoration, traditional material and technology

1. Introduction

Nepal is very rich for its architecture and cultural heritage. Mainly two types of architectural typologies of temples can be seen in Kathmandu valley i.e. Multi-tiered roof and Shikhara style. Shikhara is a brick or stone temple of geometrical shape with a tall central spire rising to the heavens, suggesting the peaks of the surrounding mountains. Shikhara are found in

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different shape and size with different architectural features and popular during the 16th century. (Gutschow, 2014)

In kirtipur area, mainly two number of stone temple exists. Among those two Shikharas, Loh: Degah, meaning stone temple in Newari is larger one and located in Ward No. 10, Loh: Degah Tole. This Shikhara is at the intersection of three roads coming from Baku Nani from the North West, Chithu way at the east and at south is the way to Mantole forming "Y" junction.

According to the inscription of temple, Loh: Degah was built in Nepal Sambat 784 by Bajracharya Family. It took total one full year and completed in NS 785 in the same month of following year. The temple was built in Granthkut style, and the final ritual was held in Poush 785, two months after the completion of temple. This ceremony was on the day of solar eclipses and attended by the king of Patan, Srinivas Malla (Shrestha -2057). Another inscription on the entablature of the facade, has Sanskrit slokas in praise of Sakyamuni Buddha, his consort, and his mother. Mainly temple is dedicated to Tri-Ratna (Buddha, Dharma and Sangha).

1.1 Features of Temple

Loh: Degah is very unique temple with perfectly amalgamation of Hindu and Buddhist culture. This temple is Square in plan with three levels of plinth. On the lowest plinth in northern direction has a pair of guardian lions and guardian deities known as Mahankals .Temple consists of central chamber surrounded by a colonnade of 12 octagonal stone columns, with an entrance to the northeast with beautiful wooden carved door and stone Toran. The temple, incorporates fine carvings, of the Panchha Dhyani Buddhas with the forefingers crossed and the palms facing inwards. Every façade of the chamber have Hindu

gods (Ganesh, Baghbhairab, Mahankal, Lokeshwor, Tara) and Dhyani Buddhas in the upper ones, arranged according with iconographic rules. This features made it archeologically very important.

The ceiling of the chamber is corbelled. There are no steps on the interior to give access to the inside of the tower, but there is a small opening in the center of the ceiling of the shrine. The top of the tower also has a narrow shaft, open to the sky. Above the Cornices, in first floor of the temple in every direction centrally in form of Rathas style, Burja are made with Pancha Buddha in all four direction. Every Burja has the base of different animals as the vehicles. Elephants, flying Urushingha, horses and birds can be seen in seven numbers each in base. Around the base of the tower, which has the characteristic slightly bowed profile, are shrines on each face in the form of projecting windows, with smaller niches above and ended with Cornice at top with gold plated copper Pinnacle.

The temple formerly housed images of Sakyamuni Buddha, Pragma Dev and Padmapani Avalokitesvara. In the years between 1979 and 1982 all the images were stolen and were never recovered. Now in present day replica is made and replaced.

2. Restoration of Temple

As Gorkha Earthquake 2015 had affected a lot of monument of Kathmandu valley and other different districts, Loh: Degah is one affected partially in Kirtipur. (Affected monuments 2015, DoA). The main body of Shikhara was damaged and cracks were developed vertically up to the base of Gajur level. South façade of Shikhara was more damaged comparing to other facades. On the south eastern corner line of Shikhara seems damaged and layers of stone are shifted to inside in masonry wall and

diagonal cracks are developed in upward and downward at both direction. So structural studies was essential for conservation of temple and after study, the temple is suggested to dismantled up to the first floor level and restoration should be done. While ground floor walls, its condition and alignment was well checked before conservation. As this temple is made with the stone from outside and Ma-Apa brick in inside with thick wall with mud mortar. Stone is the main material of this temple with all carving works of Cornices, icon of different gods, windows, Torans, and other elements of temple seem in outer façade.

The Department of Archaeology is the main government authority for conservation and management of all tangible and intangible cultural heritage of Nepal by Legislative provision. DOA has allocated budget for the restoration following the prevailing procurement practice in Nepal.

2.1 Documentation Work

For the conservation of temple, inventory and its drawings are the most important. Inventory was found in Department of Archaeology but drawings was not found, while some sketches were present in some reference books related to Kirtipur. So firstly documentation work was given main priority and full inventory was prepared by appointed Site engineer of DoA with detailed photographs, engineering drawings, and cost estimate of project as well as. Then conservation notes which is essential part in conservation for its historical and archaeological value, is prepared by project In-charge.

As per time, Vertical and diagonal cracks start increasing slowly on south façade of Shikhara, so conservation was necessary to minimize the damage level and to stop any further destructions. From close observation of temple, it was found out that vertical cracks developed on southern façade are exactly on the earlier

renovated parts. In previous conservation work those cracks were sealed by cement mortar and cracks are formed at the section again with mortar joint with larger gap between stones. From that vertical cracks other diagonal cracks were developed in both upward and downward direction. So dismantling the structure up to the first floor Cornice level is decided by restoration with same materials and traditional technology.

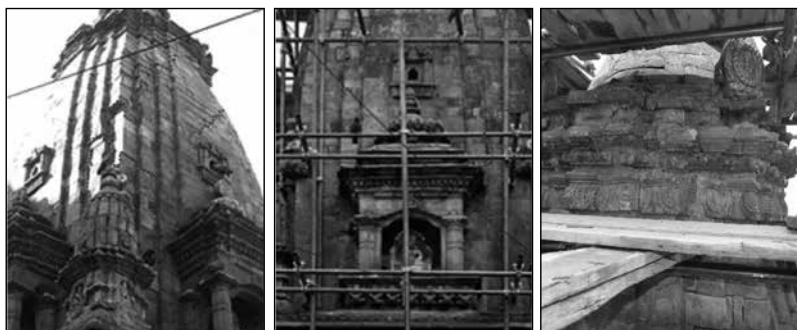


Figure 1- Pictures showing development of cracks due to earthquake 2015, Source-Author

2.2 Construction work

Intangible culture plays a great role in any restoration works. So according to Hindu mythology before any conservation works of monuments, Chhema puja is conducted. That is taking forgiveness from god to carry out any type of intervention, it is believed that Chhema puja will allow to work and there won't be any types of problems and working environment will be well. So in special day (sietā) according to Gubaju (priest) special puja was done. In this temple Sa: Dan: (offering cow to god) was done as per directed by priest.

In this puja local stakeholders, contractor, skilled manpower, engineer, project in -charge combined and do puja and get blessings from god. These intangible cultures will give values



*Fig2- Renovation of temple
started with Chemma Puja),
Source-Author*

to monuments.

After appropriate scaffolding at all direction, the first work started with numbering of stones. According to the layer on the façade of existing temple, all layers of stone were numbered as per layers and façade, with different color of temporary markers. Those numbering were also noted on notebook for cross matching. This is very important part of working in order to restore monument in exact its

shape and proportion. As stone pieces, with their location plays vital role for the perfect shape and proportion of temple, after completion of numbering work than dismantling work was done carefully from gajur. Another important part after dismantling is proper storage and management of dismantled objects. Stones with numbering is placed as it was in storage. Each layer is displayed with as per numbering and location. This really helps in restoration work. All the Burja of four direction, their carved base, Cornices, sculptures and statue of Buddhas of all four direction are stored well. As we have living culture so even temple is dismantled, regular puja was there and Kalash of gajur is taken as spiritual so that is also stored in one room and worshipping is done regularly by concerned local people of Guthi. In this way culture and construction was going on side by side.

As mention earlier, interesting part of this temple is made of stone just in outer façade, inner wall is of brick masonry which seems unpredictable before dismantling. For strengthening

the masonry wall and to bind the outer stone wall and inner brick wall at certain interval in inner portion, diagonal long stones are used. Those diagonal stones also act as staircase as well in case of some renovation is needed. Stones are bind with mixture of lime, surkhi and sand (1:1:2) as mortar. The garbha /deity room was in intact position without any affect, still is strengthen with vertical and horizontal them and nidal system of salwood. While in restoration work, almost all stones of outer façade are in good conditions and re-used, only minimum new stones are changed, which are damaged. Stones used in structure are sand stones. Stones of Cornices are big and huge with beautiful carvings, and almost in intact position. So Cornice stones are locked in internal part with metal binding for strength so that can be in intact position, which was found in existing as well while dismantled. In Newari terminology that metallic band/chain is known as "payki".

The main intervention in this Shikhara, is addition of vertical and horizontal salwood members. In other to make structurally sound, at Cornice level salwood chaukas are used, which bind each other from Cornice level and vertically in every 3'-6" another form of chauka was used similarly. Which is supported by vertical wooden post in corners of masonry wall. Those members also help in loading system together with masonry walls. Which can be seen in many conservation works after earthquake. Documentation help perfectly to restore the temple in its shape and size together with proportion so tapering of Shikhara was nicely done. Buddha statues, other stone carved sculptures with high value all fixed as per documentation and Gajur base with carvings, and copper Gajur was refitted in its exiting position after certain maintenance and cleaning work.

Hence, for restoration projects, documentation plays a great role, along with that management by contractor, supervision and monitoring by DOA is essential. Similarly skilled manpower is also the most important. In this temples, workers

are from Chovar and Kirtipur, and they are well known for their masonry and carpentry work. Dedication for work and traditional knowledge is very important while conservation. So in this restoration work, they did minutely work from measuring, making, balancing to fixing the elements in exact position. Their skill and dedication helps in restoring the architectural as well as archaeological value of this monument. Local stakeholders are also equally involve in this project, they support with puja's of temple and other management works as well. After completion of temple, again chemma puja, known as Pran pratishtha (Jiban nash: - give life to deity as well to temple) puja was done and monument is open for all devotees as usual.

3. Conclusion

Loh: Degah is on significant monument in Kirtipur. It is master piece for studying iconography of Hindu and Buddhist religions. Architecturally this temple is very rich and have unique features. Among the monument affected by earthquake 2015, this temple was timely conserved. Conclusion drawn from this project is for any work to be completed successfully, a good co-ordination is the most. In Construction work without skilled manpower, contractors and support of local communities successful completion of project is almost impossible. So all the concern parties, their ideas on the heritage should be acknowledged and Conservation should be done with use of Maximum original traditional materials and in traditional technology with proper and plenty of documentation.

Photographs



Figure 3- Pictures showing the storage of dismantled elements of temple as per munbering done.



Figure 4- Pictures showing conservation works in different levels of cornices source authors.



Figure 5- Pictures at time of restoration, from left-central hole of first floor, main body of Shikhara showing masonry, outer face of Shikhara.



Figure 7- Temple after dismantled upto first floor level.

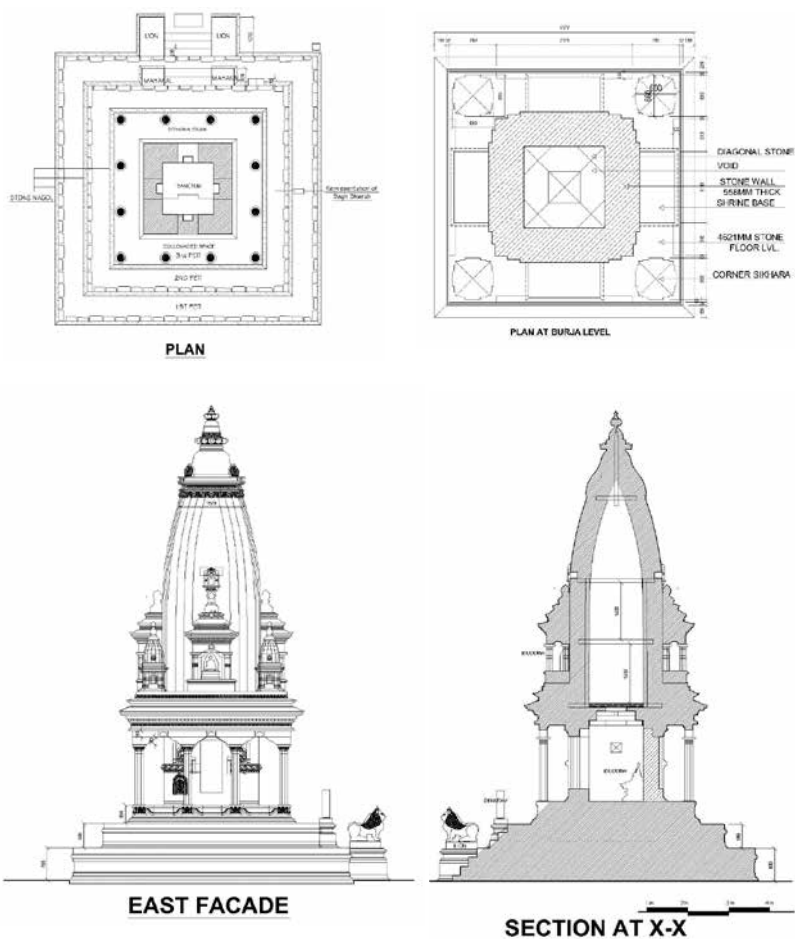
Figure 6- Temple affected by earthquake (before restoration)



Figure 8- Temple during restoration work.



Figure 9- Temple after completion of restoration work.



*Fig 18- As Built Drawings of Loh: Degah (Stone Temple)
Source- Department of Archaeology*

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Bioinformatics: Structure and Function of Proteins



👉 **Pradip Khanal*** **Bikash Acharya****

Introduction

Protein is a highly complex molecule found in all living things. Proteins have a high nutritional value and play a direct role in the chemical reactions that keep life going. Protein is the basic pillar of our lives. They are, responsible for catalyzing and regulating biochemical reactions, transporting molecules and forming the basis of structures (such as skin, hair and tendons). The shape of a protein is determined by its amino acid sequence. There are 20 different types of amino acids. Each amino acid is recognized by the side chain that determines its amino acid characteristics [1].

Amino acids are divided into four categories: polar non-polar, basic, acidic, polar and non-polar. It is again classified as hydrophobic (attracted by water) and hydrophilic (repelled by water). Amino acid has many inherent properties, which are related to determining the structure of a protein. One of the most important distinguishing factors of amino acid is

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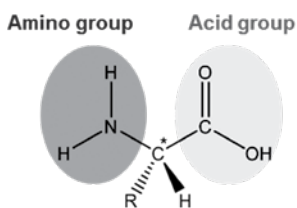


Figure 1- Basic structure of Amino acids [2]

their different tails, also known as R groups. Other factors play a key role in determining the final structure of the protein. These include: The energy level of structure needs to be low and is stable, and there is a correlation between amino acids [2].

Among the different types of amino acids, the "variable" group bears the greatest responsibility for variation because they all have hydrogen, carboxyl, and amino bonds. Amino acids are linked by dehydration synthesis until a peptide bond is formed. A peptide bond is generated when two amino acids come together to form a protein. A dipeptide is made up of two amino acids linked together, tripeptide is made up of three amino acids linked together, similarly, a polypeptide is made up of several amino acids connected together [3]. When many amino acids are joined by these bonds, a polypeptide chain is formed. One or more three-dimensionally twisted polypeptide chains form a protein. The structure of the protein can be spherical or fibrous, depending on its specific function (each protein is specialized). Globular proteins are usually compact, soluble, and spherical. Fibrin is usually elongated and insoluble. Spherical and fibrous proteins can have one or more types of protein structures. The protein has four structural levels: first, second, third, and fourth. These levels determine the shape and function of the protein and are distinguished from each other by the complexity of the polypeptide chain. The elementary level is the most basic and basic, while the fourth level describes complex combinations.

Different structures of Proteins

Proteins are vital to all living things. Understanding the function

of a protein necessitates an understanding of its structure, as the structure of a protein is critical to its function. Understanding the protein structure is necessary to comprehend how a protein achieves its ultimate shape or conformation. Four different levels of protein are as follows [4].

1. Primary structure

Proteins' primary structure is the specific ordering of amino acids that make up their chains. The amino acid sequence in the polypeptide chain is the protein's fundamental structure. The core structure of a protein is maintained by covalent peptide bonds that connect the amino acids. The precise sequence of proteins is critical since it defines the protein's ultimate fold and, as a result, its function. Proteins are made up of a large number of polypeptide chains linked together. The amino acids in these chains are organized in a specific sequence that is unique to each protein. Any change in the sequence changes the entire protein.

2. Secondary structure

Once the primary structure of a polypeptide is created, the protein sequence begins to twist and fold in a regular way due to the interaction of the amine and carboxyl groups of peptide chain. Folding of amino acid sequence in poly peptide chains forms two different types of structures: helix and pleated sheet. This structure is formed by hydrogen bonding between the -CO and -NH groups of the peptide bond, which causes the backbone of the polypeptide chain to fold in a regular pattern. Segments of the protein chain, on the other hand, may develop their own local fold, which is simpler and commonly takes the form of a spiral, expanded curve, or loop. Secondary elements are local folds that make up a protein's secondary structure.

3. Tertiary structure

Hydrogen bonds, electrostatic forces, disulphide connections,

and Vander Waals forces solidify this structure, which results from additional folding of the protein's secondary structure. The tertiary structure of proteins refers to the overall folding of polypeptide chains as well as the secondary structure folding. Folding of secondary structure gives rise to two molecular shapes called fibrous and globular.

4. Quaternary structure

The quaternary structure is formed by the spatial arrangement of numerous tertiary structures. Some proteins are made up of sub-units, which are made up of two or more polypeptide chains. Quaternary structure refers to the spatial arrangement of these components in relation to one another. Each protein folds into its own unique and biologically active three-dimensional fold, known as the tertiary structure, based on its amino acid sequence. Proteins are made up of several secondary components, some of which are simple and others which are more complex. Domains are sections of the protein chain that have their own three-dimensional fold and can be linked to a specific function. Today, these are regarded as the functional and evolutionary building blocks of proteins. Organic or elemental components are required for the activity and stability of many proteins, the majority of which are enzymes. As a result, studying protein evolution not only provides structural information, but also connects proteins from various regions of the metabolism.

Protein types and their functions

All proteins are classified into one of seven main protein types. Antibodies, contractile proteins, enzymes, hormonal proteins, structural proteins, storage proteins, and transport proteins. These proteins have specific functions in the body.

Antibodies are specialized proteins that help the body defend

itself against antigens and other foreign invaders. Because of their ability to move in the bloodstream, the immune system can employ them to identify and protect against bacteria, viruses, and other foreign invaders in the bloodstream. Antibodies work against antigens by immobilizing them so that white blood cells can eliminate them.

Muscle contraction and mobility are controlled by contractile proteins. Actin and myosin are two examples of these proteins. Actin, which controls muscle contraction as well as cellular movement and division processes, is abundant in eukaryotes. Myosin provides energy to actin, allowing it to carry out its activities.

Enzymes are proteins that help to speed up and facilitate biological reactions, which is why they're called catalysts. Lactase and pepsin are two well-known enzymes, both of which are known for their roles in digestive medical problems and specialist diets. Lactose intolerance is caused by a lactase deficiency, an enzyme that breaks down the sugar lactose found in milk. Indigestion is caused by a lack of pepsin, a digestive enzyme that acts in the stomach to break down proteins in food. Other digestive enzymes include those found in saliva, such as salivary amylase, salivary kallikrein, and lingual lipase, which all have vital biological activities. The principal enzyme found in saliva is salivary amylase, which breaks down starch into sugar.

Hormonal proteins act as messenger proteins, assisting in the coordination of various body operations. Insulin, oxytocin, and somatotropin are a few examples. Insulin controls blood sugar levels in the body to manage glucose metabolism, oxytocin increases contractions during childbirth, and somatotropin is a growth hormone that stimulates protein production in muscle cells.

The fibrous and stringy nature of structural proteins makes

them excellent for supporting other proteins like keratin, collagen, and elastin. Keratins help protect the skin, hair, quills, feathers, horns, and beaks of animals. Connective tissues such as tendons and ligaments rely on collagen and elastin for stability.

Storage proteins keep amino acids in reserve until they're needed. Ovalbumin, found in egg whites, and casein, a milk-based protein, are examples of storage proteins. Another protein that accumulates iron in the transport protein hemoglobin is ferritin.

Transport proteins are proteins that transport chemicals from one location in the body to another. One of these is hemoglobin, which is in charge of delivering oxygen through the blood via red blood cells. Another type of transport protein is cytochromes, which act as electron carrier proteins in the electron transport chain. [5].

Artificial Intelligence for determination of protein structure and functions

Protein structure predictions are bioinformatic techniques that predict protein structures based on the amino acid sequence of a protein. Protein architectures are essential because they can reveal information about biological functions. As a result, determining protein structures is critical for both understanding the fundamental biology of health and disease and designing therapeutic molecules. Although sophisticated experimental techniques such as X-ray crystallography are used to determine protein structure, computational methods for protein structure prediction are preferred when experimental tactics are limited [6].

Traditional techniques have failed to reduce the gap between protein data with known structure and protein data with

unknown structure while protein data continues to rise. As a result, numerous computer-based strategies for predicting protein structure have been devised to close this gap. Over last decades, machine learning has become an effective tool in a variety of applications in recent decades, including the prediction protein structure, thanks to the rapid advancement of computer science. Deep learning has revolutionized machine learning in recent decades, and some experiments have used deep neural networks to predict protein contacts based on sequence knowledge. Deep learning has gained a lot of attention in recent years as a result of its remarkable success in a number of important application fields, such as image classification and speech recognition, though there is still space for improvement in deep learning for protein structure prediction.

A Google AI offshoot Deepmind has constructed an artificial intelligence (AI) network. DeepMind has taken a giant step forward in addressing one of biology's most difficult problems: predicting a protein's three-dimensional form from its amino-acid sequence. DeepMind's software, called AlphaFold, outperformed more than 100 other teams in the CASP (Critical Assessment of Structural Prediction) challenge, which is held every two years. This has huge boon towards life sciences and medicine. While full details of AlphaFold's 2020 algorithms have not been publicly released, more are expected when DeepMind publishes scientific papers describing its methods and results.[7]

BIOINFORMATICS IN NEPAL

In the realm of bioinformatics, Nepal holds a lot of promise. Nepal is abundant in natural resources, with a diverse range of plants and animals, some of which are endemic, endangered, or threatened. The major objective of a bioinformatician would be to learn everything there is to know about each species,

including its location, usage, height, feeding behavior, life cycle, genetic information, and incubation duration.

The initial move towards moderating Nepal's regular assets is utilize computational apparatuses to record different highlights of Nepal's plant and creature species. Another work for bioinformaticians is to expect the design of mixtures found in these plants and to develop medicinal drugs dependent on these atoms. [8]

Practical applications of Bioinformatics

The following are the practical applications of bioinformatics. [9]

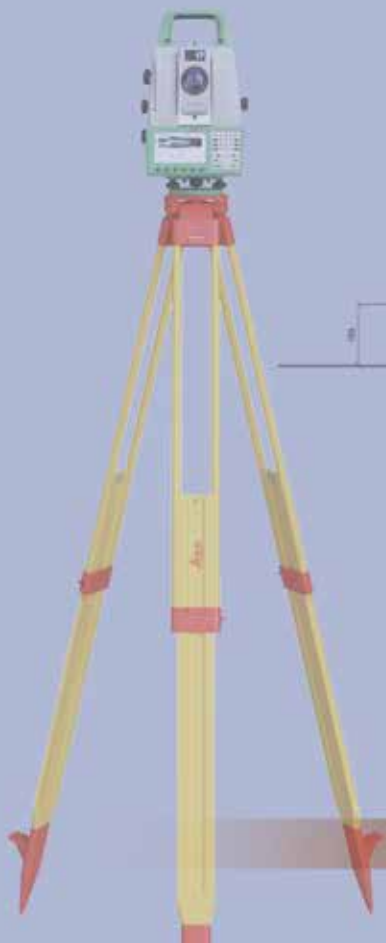
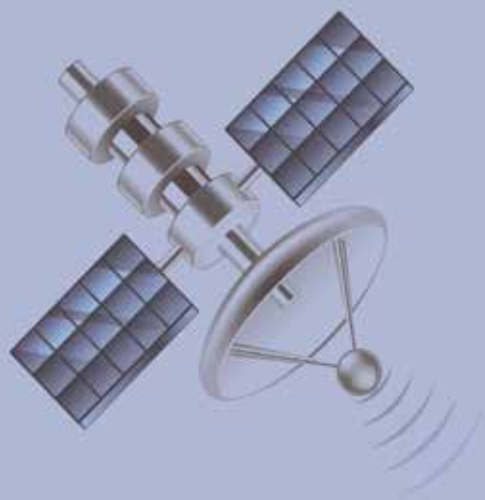
1. Drug design and gene therapy
2. Application in medical sciences
3. Experimental genomics
4. Functional genomics
5. Microbial, plant and animal genomics
6. Insilco testing

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