



NESAJ PATRA

Volume 10

March 2013

EDITORIAL BOARD

Advisors:
Dr. Achyut Sapkota
Parveen K. Chhetri

Editor:
Suman Dahal
The University of Tokyo

**Coordinator/
Layout and Design:**
Justin Shrestha
Hokkaido University

INSIDE THIS ISSUE

Contents	Page
President's Message	3
Editorial	4
ARTICLES	
FORMALIZATION OF DECENTRALIZED COOPERATION MODEL FOR DISASTER SIMULATION -Bipin KHANAL ¹ , Nobuhiro ITO ² , Kazunori IWATA ³ , Naohiro ISHII ⁴	5
NEPALESE ECONOMY: WHERE WE ARE NOW AND WHERE WE NEED TO GO? A PROPOSAL FOR LONG-TERM VISIONARY MODEL OF DEVELOPMENT -Damaru Ballabha PAUDEL	13
APPLICATION OF FAST FOURIER TRANSFORMATION (FFT) IN FLOW VISUALIZATION TECHNIQUES TO DETERMINE QUANTITATIVE ANALYSIS OF PIPE FLOW -Kiran SHRESTHA	21
NONLINEAR BUCKLING BEHAVIOUR OF CFRP REINFORCED THIN-WALLED STEEL CYLINDERS UNDER LATERAL PRESSURE -Krishna BHETWAL ¹ , Seishi YAMADA ² , Yukihiro MATSUMOTO ³	30
WATER RESOURCES MODELING AND OPTIMIZATION FOR PLANNING AND MANAGEMENT OF A WATERSHED: A CASE STUDY OF BABAI RIVER BASIN OF NEPAL -Manoj SHRESTHA	37

Contents	Page
SEISMIC RESPONSE ANALYSIS OF UNREINFORCED BRICK MASONRY STRUCTURE SYSTEM -Rishi Ram PARAJULI	48
POLITICAL ELITE CAPTURE SYNDROME IN CITIZEN PARTICIPATION <i>Perspectives from Nepalese Local Governance</i> -Suman DAHAL	54
एक प्रयोग -भोगेन्द्र मिश्र	59
हाइकु समाट माचुओ बाशो -प्रकाश पौडेल माइला	61
आखिर मैले चाहेजस्तो किन हुँदैन ? -वेद प्र० काप्ले	66
NESAJ Activities Report	68
Photo Gallery	73

Presidential Message



First of all, we would like express our sincere thanks to NESAJ-PATRA editorial board 2013 for the successful completion on its publication. In spite of limited interval of time, I think, NESAJ Patra Editorial Board have a done a challenging work on its publication.

As the president of the 14th executive committee, I am truly honored and humbled to be associated with this organization that has an amazing number of devoted students as well as abundance of exemplary talented people that makes up our community. Nepalese Students Association in Japan, shortly NESAJ, founded in 1997 for the sake of Nepalese students in Japan. We are very proud that these 16 years of historical association in the context of Japan, now became a stronger manpower that is continuing their bilateral support to exchange the culture, academic knowledge and welfare activities. Together, we have the opportunity to build an even stronger organization by capitalizing on our past activities and recognizing the opportunities that are before us. I have been privileged to serve on this organization since 2009. It has been a pleasure to get involved in the public and witness how much this organization has grown and prospered in such a short time. One of the key elements in NESAJ is resilience, with that, we have no doubt we will continue to make further progress. NESAJ Patra is another part of its annual activities and has been taken as semi-scientific Patra, covering the whole range of research work as well as literatures. Publication means itself is a heavy burden of responsibility and also, to pileup the wide range of research work and literatures is indeed a hard work. I would like to convey my personal thanks to their endless effort on making continuity of its publication and covering the wide range materials in this issue. Also, to promote and sharing the knowledge between researchers, students and other Nepalese personnel, NESAJ PATRA 2013 would be able to create and beneficial to prosperous, peaceful and developed Nepal. Apart from these, I hope all the well-wishers of NESAJ, respected members and students will enjoy and find some guidance in terms of knowledge. I hope, this NESAJ PATRA 2013 will be another precious material of NESAJ family.

On the behalf of the entire executive committee members, I would like to thank all the pioneers for their hard work and contributions in completing this volume of NESAJ PATRA, once again and look forward to their continuous involvement and cooperation in future NESAJ activities too.

Thank you!!

**Krishna Bhetwal
President
14th Executive Committee**

Editorial

It is my great pleasure to finally publish our new volume of "NESAJ PATRA" despite facing some hurdles on the way. But, I am immensely thankful to all the authors who contributed their articles and made it possible to publish on time despite those challenges.

This issue consists of altogether 10 articles which include one economy related article, one governance related article, five scientific and technical articles and three articles related to Nepalese literature. I assume that this issue is full of divergence of content for any reader that can discharge entertain as well as gives ample knowledge on different theme. Apart from that summary of the NESAJ activities along with the photo gallery are also included at the end.

I really appreciate all the contributions made by our colleagues who helped us to publish this issue successfully. Comments and suggestions are always valuable for continuous improvement so we are hopeful and encourage our respected readers to send us your feedback after going through this issue. Finally, I would like to request the readers to tolerate with the grammatical and typological errors, if found any.

Thank you all !

Suman Dahal

Editor

NESAJ Patra Volume 10

Email: suman2034@yahoo.com

FORMALIZATION OF DECENTRALIZED COOPERATION MODEL FOR DISASTER SIMULATION

Bipin KHANAL¹, Nobuhiro ITO², Kazunori IWATA³, Naohiro ISHII⁴

^{1,2,3,4}Department of Information Science, Aichi Institute of Technology, Aichi Prefecture, Japan

ABSTRACT: In Disaster Simulation, multiple heterogeneous agents work together, forming a cooperative team, in a common environment to achieve a common goal. Researches related to agents' action in dynamic environment are still countable. As the expected results using dynamic environment may not be very certain/effective, the current Disaster Simulations are forced to use centralized system in which the central agent is handling the communication, cooperation and coordination activities of all other agents. In centralized system, if the central agent (*that is controlling the whole system*) fails then the whole system could crash. Also, if we cannot skip the effect of dynamic environmental conditions in centralized system, there could arise a question mark in the performance of the whole system. This paper focuses on such performance bottlenecks caused by centralized model introducing a decentralized model for cooperation and its formalization. Change in the environment of the whole system is also being one of the main issues in current Disaster Simulation projects. We describe how the decentralized model could be the best solution for robustness of the performance of the Disaster Simulation and we also discuss about how to formalize the group for decentralized cooperation model in dynamic environment.

1. INTRODUCTION

Disaster Simulation is a Multi-Agent System where multiple heterogeneous agents work together, forming a cooperative team, to achieve a common goal. A Multi-Agent System (MAS) is a system composed of multiple interacting intelligent agents. Multi-agent systems can be used to solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Multi-agent systems can be used to solve problems that are difficult or impossible for an individual agent to solve (Wiki). Natural disasters are becoming very common these days. Disaster Simulation (hereafter DS) is an approach for studying ways to rescue victims of disaster and reduce disaster damage. In DS, participating agents such as the fire brigade, ambulance team, and police force work together to achieve the common goal of rescuing victims of disaster in a given environment (Khanal et al., 2011). In other words, Instead of human beings, Robocups (Agents) with different capacities play the role of rescuers and save people in the case of large-scale disaster.

1.1 Existing concept of DS

Current DS is using centralized system in which the central agent that controls the whole system is handling the communication, cooperation and coordination activities of all other agents. A number of researches related to the change in environment, i.e. dynamic environment in MAS are ubiquitous but the implementation of their results is still lacking. Because of this, the expected results using dynamic environment could not be very certain/effective. Hence, the current DS is using the centralized system. The use of central system can slow down the performance of the whole system. Specifically, having one agent in charge of handling the communication, co-operation and coordination of the activities of all other agents could result in a performance bottleneck (Rahwan, 2007). In centralized system, if the central agent, the heart of the whole system, fails then the whole system could crash.

1.2 Current issues in DS

All other things except agents are their environments in MAS and same in DS. According to Gemma Bel-Enguix and M. Dolores Jiménez-López, “*the environment has been recognized as an explicit and exploitable element to design Multi-Agent Systems (MAS)* (Bel-Enguix and Jiménez-López, 2007). *It can be assigned a number of responsibilities that would be more difficult to design with the sole notion of agents*”. In other words, environment is a first-class abstraction that provides the surrounding conditions for agents to exist and that mediates both the interaction among agents and the access to resources. From above explanation of the environment, we can say that any changes in the environment can have enormous effect in the movement of agents in MAS. This is one of the main issues in MAS as well as in DS. If we skip the effect of dynamic environment, then the use of centralized system could be the best approach. But when we have to consider the dynamic environment, the use of centralized system could arise a question mark in the performance of the whole system.

Only considering the dynamic environment will not solve the problem of current DS. Modeling the cooperation of agents in a dynamic environment is of utmost importance. In this paper, we mainly focus on these issues. To make the system decentralized, we need to re-structure the DS and re-model the cooperation of the agents.

2. ENVIRONMENT AS AN AGENT

According to Nobuhiro Ito, Kouichi Nakagawa, Takahiro Hotta, Xiaoyong Du, Naohiro Ishii (Ito et al., 1998), we got a clear concept of modeling environment as an agent in MAS. In this research, we consider environment as an agent because of the following reasons.

1. To decrease the unnecessary communication with the central agent so that the performance speed gears up.
Global Environment sends the required information to the *Local Environment* and from there it is conveyed to other agents. The main objective of *Env* (as an agent) is to provide the updated information to the agents. Agents can communicate only with its Local Environment (*Env*) irrespective of the communication to the Global Environment (*ENV*) so that any unnecessary communication is avoided. Even if the other agents in the given local environment are busy, the environment agent, *Env*, can receive the information from the *ENV* and get updated.

2. To allow agents to do calculations independently.

Since the Environment agent (*Env*) sends all the required data to every agent, they can make calculations independently and update the results irrespective of the Global Environment (*ENV*).

3. To provide a medium for data transfer for all agents within its area.

After calculation, agents update their results to their Local Environment and it holds the data so that other environment agents can access it at any time they need.

4. To take part in cooperation, so that an effective cooperative team could be generated.

If the environment agent also takes part in cooperation, a team including the environment can be created and thus the updated information can be tracked by all agents when necessary so that the cooperation is not violated unnecessarily.

Considering Environment as an agent, the system will be decentralized providing independent calculation and communications among all the agents. Now we discuss about the new approach of the decentralized disaster simulation.

2.1 A new structure of DS

We consider Environment as one of our agents in our new structure of DS. The figure below describes the clear view of our new structure.

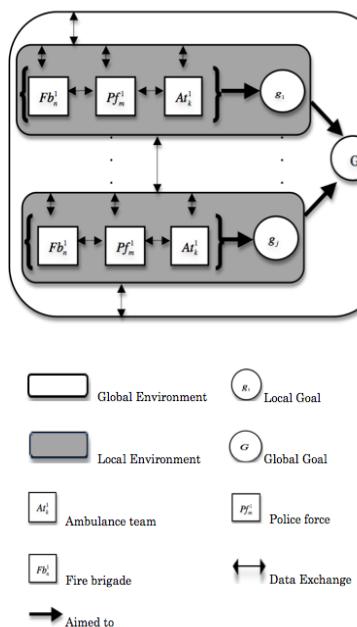


Fig. 1 Structural diagram showing relations between agents

In Fig.1, we have a Global Environment (*ENV*) that contains sub environments and a common goal(*G*). Sub environment here is considered as Local environment (*Env*) that includes Fire brigade (*Fb*: varying in number from 1 to *n*), Police force (*Pf*: varying in number from 1 to *m*), Ambulance team (*At*: varying in number from 1 to *k*) and Buildings as local goals (*g*: varying in number from 1 to *j*). All the agents *Fb*, *Pf* and *At* work together to achieve a local goal (*g*) within a local environment (*Env*) provided that the number of all the agents taking part in the action may vary correspondingly. Once all the local goals (*g*=number of buildings: varying from 1 to *j*) are accomplished, then global goal *G* is supposed to be accomplished.

2.2 A new approach to DS

In this approach, we consider environment as an active agent that has a big role in DS. Fire Brigade, Police Force and Ambulance Team are other active agents that too have very big role in DS. We are introducing some additional attributes to the agents like *Status*, *Priority* and *Free Flag*, which are of utmost necessity while working in a dynamic environment.

Agents and their parameters are as follows:

Status S: It describes the current environmental status as compared to the previous one and is defined by using 0 or 1. Initially it is 0, if there is a change in environment, it is set to 1 and it is 0 for next change and so on.

Priority P: It describes the priority of each agent. Priority can be categorized into three levels.

High (2): Agents that have a very active role have high priority. Initially all agents have high priority.

Medium (1): Agents whose role is not very active have this priority. For example, in the case of heavy rain, the use of Fire Brigade can be either suppressed or avoided. These types of agents are considered to have a medium priority.

Low (0): Agents that are out of order or that do not have active role in the team. For example, while working in a team, if any individual agent completes its task, and if it does not have any more stamina, its priority is comparatively set to low so that the cooperation of the rest team is not disturbed by it.

From above explanation, we can say that the attribute *Priority* is very important in case of dynamic environment. The Priority is necessary to avoid the unnecessary involvements of disturbing agents in the cooperation. Agents enter the cooperation on the basis of priority.

Free Flag F: This attribute defines whether the agent is free or not. For free agents, it is set to 1 and 0 is set for busy agents.

In this research, we suppose that the communication between agents is always possible. The step-wise explanation of our new approach is described as below.

STEP 1: Global Environment (*ENV*) sends data to all other agents by setting the attributes S to 0, P to 2, and F to 1.

send_to_all_agents(S,P,F,...)

STEP 2: As all agents know their position, they can calculate their distance to the buildings in a given environment and send necessary data to all other agents. The data includes *myID(my_id)*, *BuildingID(Bld_id)*, *Distance (D)*, *Status(S)*, *Priority(P)*, *Free Flag(F)* etc.

```
receive_from_ENV(S,P,F,...)
calculate_Distance()
send_to_Agents(my_id, Bld_id, D,S, P, F,...)
```

STEP 3: The agents always accept messages from the Environment and messages from other sources only when they are free (initially all agents accept messages from each other). All agents create their own task list using the data sent by other agents based on the priority and the shortest distance. As a result, the agent with the shortest distance to the building with high priority comes on the top of the list and so on. This task list is updated to the Local Environment (*Env*), for the access by other agents. *Env* sends signal to agents to start cooperation and work by setting the F to 0 for all agents within it.

A simple example of program flow of agent when it is free can be described as follows:

```
if(free){
    if(msg_from_agents){
        receive_From_Agents(my_id, Bld_id, D,S, P, F,...)
        create_task_list()
```

```

update_Task_List_To_Env()
}else if(msg_from_Env){
    receive_msg_of_Env()
    cooperate()
    if(finished){
        set Free_flg=1;
        send_to_Env(finished_task,F,...)
    }else{
        work();
    }
}

```

Once the task is accomplished, F is set to 1 so that agents can take part in another task.

STEP 4: After the completion of the task in the task list, *Env* updates the accomplished task to *ENV* and all the above steps from STEP 2 are repeated recursively unless all the local goals are accomplished.

If there is change in *Env*, it re-allocates the task to the agents within it without disturbing the other *Env* agents. But if *ENV* is changed, all the processes are repeated from STEP1.

3. GROUP FORMATION

The group formation begins when the initiator recognizes the potential for cooperative action in order to reach the goal. In our research, we consider *Env* as an initiator. The stage of potential recognition is concerned with finding the set of agents that may participate in the formation of the group aiming to realize the common goal.

In our model, the members with same local goal g ($g \subseteq G$) can form a group if $P = 2$ or 1 (for effective group $P=2$) and $F=1$. The members of the group should not only be willing to cooperate with others but they should also have relevant skills and resources at their disposal.

Role of *Env* for group Formation

The first task of local *Env* is to form a partial plan for achieving the local goal *g*. According to the goal, it determines the characteristics of agents that are most suitable to form the group. In order to determine this match, the *Env* needs to find out relevant properties of the agents, being interested in four aspects: their *abilities*, *willingness*, *opportunities* and *individual type*.

Ability and willingness: These characteristics of agents can be decided by P. If P=2 or 1, we can consider that agents have willingness to and are able to achieve the goal.

able(At,g) iff P=2 or P=1 where At ⊆ AT

able(Pf, g) iff $P=2$ or $P=1$ where $Pf \subseteq PF$

able(Fb, g) iff $P=2$ or $P=1$ where $Fb \subseteq FB$

willing(At,g) iff P=2 or P=1 where At ⊂ AT

willing(Pf, g) iff $P=2$ or $P=1$ where $Pf \subseteq PF$

willing(Fb, g) iff $P=2$ or $P=1$ where $Fb \subseteq FB$

Opportunities: This property of agent can be

to have opportunity to enter the group.
 $opp(At,g)$ iff $F=1$ where $At \subseteq AT$

$\text{ann}(Pf\sigma)$ iff $FP = I$ where $Pf = P$

$\text{supp}(E_{k+1}) \neq \emptyset$ iff E_k looks one step better.

• **PP** ($\rightarrow \mathcal{S}$)₃₃ $\text{PP} \cdot \text{PP} \equiv \text{PP}$

Individual type: The group could be effective if agents with different types participate in it. All agents have different capabilities. To form an effective group *Env* chooses agents with different individual types . For eg. The participants for the group will be Fb, PF ,AT and Env. There should be proper type of distribution of agents in the group to achieve the goal g and that is denoted by

indvtype(At, g)

indvtype(Pf, g)

indvtype (Fb, g)

With the help of above defined properties, the *Env* can decide whether a group can be formed or not.

$can(At, g) \leftrightarrow able(At, g) \wedge opp(At, g) \wedge$

$willing(At, g) \wedge indvtype(At, g)$

other agents can be explained by similar denotations.

Thus,

$Group(Ra, Env) \leftrightarrow can(At_t, Env_t) \wedge can(Pf_t, Env_t) \wedge$

$can(Fb_t, Env_t)$

where t is the time step of the simulation.

4. A COOPERATION MODEL

A cooperative system is defined to be a system of multiple dynamic entities that share information or tasks to accomplish a common, though perhaps not singular, objective (Springer). In this paper, we can consider agents as our multiple dynamics entities that share information to achieve a common target/goal. Cooperation occurs when the agents with different capabilities have a goal in common, and their actions tend to achieve the goal. For cooperation, the most important point is communication. Wrong information may lead to the wrong result. So there should be proper message sharing in cooperation.

In this paper, we suppose that there is a very good message-sharing environment between the agents. In DS, all the agents have a common goal of rescuing victims of disaster.

Now in this section, we model the cooperation for the agents.

$AT = \{At_1, At_2, \dots, At_n\},$

$PF = \{Pf_1, Pf_2, \dots, Pf_m\},$

$FB = \{Fb_1, Fb_2, \dots, Fb_k\},$

$ENV = \{Env_1, Env_2, \dots, Env_j\}$

The sets written above are possible sets of Ambulance Team, Police Force, Fire Brigade and Environment respectively.

The rescue team can be expressed as $RA = \{AT, PF, FB, Env\}$

In Disaster simulation, we can consider the building as a goal for agents.

$G = \{Bld_1, Bld_2, \dots, Bld_j\}$

Here the number of buildings and Local environments are same because each goal is provided an environment in our new approach.

Common objective is defined as a finite set of global goals.

$O_c = \{G_1, G_2, \dots, G_m | G_i \sqsubseteq G, m \leq 1\}.$

In disaster simulation, since the common objective of all the agents is only one, i.e. to rescue, m is 1. Model of cooperation can be related to the common objective as below:

def
 $Mod = (Ra, O_c)$ where $Ra \subseteq RA$

$Ra = \{At_t, Pf_t, Fb_t, Env_t\}$ where

$At_t \subseteq At, Pf_t \subseteq Pf, Fb_t \subseteq Fb, Env_t \subseteq Env$

where t can be one of the time steps in simulation.

Relation between agent and common objective can be expressed as $Rel_Agent: RA \times O_c \rightarrow P(LG)$ where $LG \subseteq G$.

Cooperation Capability can be defined as a set of services and functionalities needed to support cooperation, such as negotiation, collaboration and coordination which can be expressed as below.

def
 $CF = \{AT_{cf}, PF_{cf}, FB_{cf}, ENV_{cf}\}$

where $AT_{cf} = \{At_{cf_1}, At_{cf_2}, \dots, At_{cf_n}\}$

$PF_{cf} = \{Pf_{cf_1}, Pf_{cf_2}, \dots, Pf_{cf_m}\}$

$FB_{cf} = \{Fb_{cf_1}, Fb_{cf_2}, \dots, Fb_{cf_k}\}$

$ENV_{cf} = \{Env_{cf_1}, Env_{cf_2}, \dots, Env_{cf_j}\}$

We represent service or control functionality by a function that brings the system from a control state to another. CS is the set of Control state.

$cf_i : CS \rightarrow CS$

$cs_t^i \mapsto cs_{t+1}^i$

$CC : RA \rightarrow P(CF)$

$Ra \mapsto \{At_{cf_t}, Pf_{cf_t}, Fb_{cf_t}, Env_{cf_t}\}$

where

$At_{cf_t} \subseteq AT_{cf}, Pf_{cf_t} \subseteq PF_{cf}, Fb_{cf_t} \subseteq FB_{cf}, Env_{cf_t} \subseteq ENV_{cf}$

where t is the one of the time steps in simulation.

The function *Cooperation* measures the ability of a society of agents to achieve the cooperation control of a global goal.

$Cooperation : P(RA) \times G_g \rightarrow \{\text{true}, \text{false}\}$ where $G_g \subseteq O_c$

An agent is able to support the cooperation needed to reach a goal Bld_1 if its cooperation capability allows to bring the system from the initial control state to a state of describing a goal.

$Cooperation(At_1, Bld_1) = \text{true} \quad \text{iff}$

$\exists Exec \square (Cap(At_1))^* . Exec(s_i) = State(Bld_1)$

def

$[f_1, \dots, f_n](s_i) = f_n(\dots(f_1(s_i))) \dots$

The functionalities here are only concerned with performing domain task.

Completeness of local goals:

Let $G = \{Bld_1, Bld_2, \dots, Bld_3\}$ be a global goal and

$RA = \{AT, PF, FB, Env\}$ be a society of agents.

$Comp(RA, G) = \text{true} \quad \text{iff}$

$\{Bld_1, Bld_2, \dots, Bld_3\} = \bigcup_{t=1}^n Rel_Agent(A_t, G)$

where

$A_t = \{At_t, Pf_t, Fb_t, Env_t\}$

Efficiency of local goals:

It states the fact that only one agent will realize the local goal.

$$\text{Effic}(RA, G) = \text{true} \quad \text{iff}$$

$$\forall i, j. i \neq j \implies \text{Rel_Agent}(A_i, G) \neq \text{Rel_Agent}(A_j, G) = \{\}$$

Role: The notion of role allows distinguishing and specifying a particular agent. It also allows characterizing the responsibilities associated to each agent.

$$\text{Role} : RA \times P(O_c) \rightarrow P(LG)$$

$$(A, Bld_1) \mapsto \bigcup_{B_{gk} \in O_c} \text{Rel_Agent}(A, B_{gk})$$

where

$$A = \{At_t, Pf_t, Fb_t, Env_t\}$$

where t is the time step of the simulation.

Mode of Cooperation: It regroups the role of cooperative agents. Let $Mod = (\{At_t, Pf_t, Fb_t, Env_t\}, O_c)$ where t is the time step of the simulation. A mode of cooperation is represented by n-tuple of roles.

$$m \stackrel{\text{def}}{=} (r_1, r_2, \dots, r_n)$$

$$M(\text{mod}) \stackrel{\text{def}}{=} \{(r_1, \dots, r_n) \mid r_i \in \text{Role}(A_i, O_c), i \in \{1, \dots, n\}\}$$

where

$$A_t = \{At_t, Pf_t, Fb_t, Env_t\}$$

where t is the time step of the simulation.

A mode of cooperation is said to be optimal if same goal will not achieved by two different agents within the same mode. $\forall i, j. r_i \neq r_j$

A cooperation strategy: A strategy of cooperation is a process that controls the well functioning of the mode of appropriate cooperation in a given situation. This depends on the mode of cooperation and environment.

E_{sys} be the set of environmental states.

$$E_{sys} = \{Env_1, Env_2, \dots, Env_j\}$$

we can define cooperation strategy as

$$ST : M \times E_{sys} \rightarrow M$$

$$(m, Env_1) \mapsto m'$$

$U_s(m, E_{sys})$ describes the states of agents and environment. A model m is adopted in Env_i of the system if and only if the condition $U_s(m, Env_i)$ satisfied.

$$ST(m, Env_i) = m' \text{ iff } U_s(m, Env_i, m') = \text{true}$$

5. CONCLUSION AND FUTURE WORK

In this research, we discussed about the issues in current DS and concluded that the change in environmental condition is one of the main issues. To solve the problem, we introduced a new approach of decentralized model and described how the decentralized model could be the best solution for effective performance of the DS in comparison with the centralized one. The benefits of decentralized system over centralized one are as under.

Calculations are equally divided to all agents,

Agents can work independently irrespective of the action of other agents.

All agents equally share communication, cooperation and coordination.

Even if one part of the system crashes, other parts can be working properly.

To implement the effect of the dynamic environment, we modeled environment as an agent and re-structured the current DS. We described that the performance of the whole system could be more effective if we use the decentralized approach considering the environment as an agent. The environment agent helped us to formalize a group and our cooperation model helped us to make a clear view of good cooperation between the agents in a dynamic environment.

In future, we are planning to implement it in currently running Disaster Simulation, i.e. Robocup Rescue Simulation. Our result should satisfy the following condition; if control and responsibilities are sufficiently shared among different agents, the system can tolerate the failure of one or more of the agents resulting in effective performance. We will continue our research to find out a possible way of cooperation even in the case when the communication channels are off; i.e. when there is no communication between agents and their environments.

REFERENCES

1. http://en.wikipedia.org/wiki/Multi-agent_system
2. Bipin Khanal, Nobuhiro Ito, Takashi Syamoto, Kazunori Iwata: RoboCupRescue2011-RescueSimulationLeague Team Description Paper<Naoto Rescue 2011> (2011).
3. Gemma Bel-Enguix and M. Dolores Jiménez-López, Agent-Environment Interaction in a Multi-agent System: A Formal Model in: Genetic and Evolutionary Computation Conference (2007)
4. Talal Rahwan, Algorithms for Coalition Formation in Multi-Agent Systems: A PHD thesis, University of Southampton (2007)
5. Mohamed Jmaiel and Hadj Kacem, A Formal Model for Cooperation and Agency in Multi-Agent System :University of Sfax LARIS Laboratory(1999)
6. Nobuhiro Ito, Kouichi Nakagawa, Takahiro Hotta, Xiaoyong Du, Naohiro Ishii, EAMMO: an environmental agent model for multiple objects: Information and Software Technology 40 (1998)
7. <http://www.springer.com/series/5788>
8. Barbara Duinin-Keplicz and Rineke Verbrugge, Teamwork in Multi-Agent systems, A formal Approach (2010)

NEPALESE ECONOMY: WHERE WE ARE NOW AND WHERE WE NEED TO GO? A PROPOSAL FOR LONG-TERM VISIONARY MODEL OF DEVELOPMENT

Damaru Ballabha PAUDEL

Doctoral Student, The University of Tokyo, Email: dbpaudel@hotmail.com

ABSTRACT: If we have clearly defined objectives, targets, indicators, long-term plan and efforts, we can make Nepal a developed country. For this, we must realize that we are going in erroneous direction at present and we need to correct it soon. Making correction in our attitudes and establishing stable political system with well democratic cultures and values, we have to make a visionary model for development. In this paper, we make a hypothetical model, and present the way to make it a success. However, the model would be a success only if we had better institutions (political and economic) which could create real patriotism and commitment towards the prosperity of our nation.

Correcting institutions such as political system, economic policies, law and order, civil societies, nongovernmental organizations in a positive way together with preserving social values and norms, we can foster the development of Nepal and make the country rich and peaceful. If the country is prosperous, no one needs to go abroad for employment as a cheap human resource. Enjoying the benefit of development, we can celebrate our well-cultured festivals together with families and relatives. Moreover, as a citizen of a peaceful and prosperous country, we will feel proud to have a Nepali passport. This is possible only with the successful implementation of a visionary model of development and planned development efforts. If so, why not to start at earliest possible.

Keywords: Nepalese economy, visionary model of development, poverty, industrial development, service sector development

1. INTRODUCTION

General Context

I have recently read a book: *Why Nations Fail* by Acemoglu and Robinson (2012), and got impressed from their as well as the other scholars ideas mentioned in the book. Kenneth J. Arrow, a Nobel laureate of economics in 1972, while praising this book mentioned that the authors have made an important contribution to the debate as to why similar-looking nations differ so greatly in their economic and political development. I would also like to ask the same question with a little moderation here in the beginning of this article- why similar-looking nations at some point differ so greatly in their economic and political status in international arena after some interval of time? More clearly-suppose two nations were in similar economic situation some 20 years before and now one is far ahead while another is far behind, why is this? Furthermore, I would like to add some more questions- why socio-economic indicators of some are continuously improving while others are more or less stable with very slow pace of improvement among these similar-looking nations? Why some escape from poverty so fast and some very slow? Do the similar-looking nations converge in some point? What is Economic development? Why is it so important for a nation and nationals to improve their standard of living? Is rapid economic growth possible for a slow pace nation such as Nepal? This whole article will try to answer these questions and attempt to propose a further way for long-term development of Nepalese Economy.

Economic development is the key factor for prosperous nation and dignified nationality. This is not short-term phenomena rather it is the outcome of myriad committed attempts in a long span of time. If high rate growth is continuously sustained for a long time, it will certainly bring economic development. To maintain long-term sustainable growth, stable policies, committed and stable institutions is the most. Based on fifteen years of original research, Acemoglu and Robinson (2012) conclusively show that it is mainly the politics, for why so many countries fail to develop. Human-made political and economic institutions underline economic success or failure. Political system, economic policies, government and its branches, non-governmental organizations, INGOs, civil societies and local communities are very important agents for economic development.

A huge investment is needed in the productive sector of economy for economic development, which we can finance by domestic saving or even can mobilize foreign saving in case of deficit of domestic saving. The investors analyze current investment policies, returns to investment and sustainability of it before making investment. If they see some incentives and security of future of their investment, they will be motivated for it. Investment friendly government policies and stable policy stances attract investors. For stable policy stances,

stable government is needed, and for stable government, stable political system is the most. Economic development will accelerate if there is stable political system. Therefore, long-term visionary development plan with stable political system is the necessity for economic development of a nation.

Nepalese Context

The properly addressed economic issues can lift the living standards of people in Nepal. Therefore, if not now but probably in near future we need to enter in the long-term planned development which addresses these issues. There is no hope of a charismatic leader like Mahathir Mohamed of Malaysia who could step up bold decisions and long-term planned efforts for the country. However, by the unity and pressure of people, why should not we plan that we will make Nepal a developed country in the coming 50 years? Is it impossible? I do not think so. Based on the experience of the path of development of successful nations, the convergence theory in economics states that similar-looking nations in terms of many aspects such as resources, geography, technology in the initial state will converge in similar way, even different looking nations will also converge in the long-run. However, what is long run? May be 30 years, 40 years or 50 years. It depends upon the pace of development of the nations. Being sandwiched between rapidly growing two giants; India and China, Nepal must benefit from their development and converge to them in long run by making clearly defined long-term development plan with clear indicators. At this moment, a national debate about long-term planned development is the most for Nepal.

Politics is the pivot and other administrative and social economic issues base upon politics. Without stable political system, development is almost impossible. Politics has different trajectories in the process of social development and it depends upon the will of people and the long-term vision of the political leaders. The one, who can learn from experiences and history and make proper plan for future, can lead a nation in right direction. Then, what is happening in Nepal? Do people have strong will power for development? Definitely, yes. Are the leaders going in the right direction with clear vision? Definitely, no. Therefore, visionary leadership is the problem for Nepal. Together with this, people's passiveness is also responsible. Myopic vision of political leaders, political instability for long time and lack of unity among people is causing the retrogression of the country.

Can we still hope for charismatic leadership who can solve all the problems in a magical way? I think we should not. Then, what can we do for the nation from our part? If we missed to think about the country now what will happen for the future generation? Let us imagine worst but most probable scenario based on our experience of today. Our future generation, will have to spend almost 24 hours of load shedding, due to high unemployment rate, most of the youths will be in foreign countries in blue colored jobs. As they show Nepali passport in the immigration of foreign countries, they will feel embarrassed and strict checking. Furthermore, they will have a psychology how to enter to a developed country even in an illegal way. If someone could not do so, he/she would have to be the activist of dirty politics. The crime rates would continuously rise, the politics would protect the criminals and honesty would not be honored. This is the worst scenario but most possible scenario if we go in the current path.

Then, what will be the best scenario for our nation? This whole article will focus this issue in the succeeding sections. Since, experiences can shape future policies in proper direction, let us analyze historical development process in Nepal.

2. REVIEW OF DEVELOPMENT EFFORTS IN THE PAST

In the background of aforementioned Nepalese context, it is very important to analyze the historical development process of Nepal in brief.

Rana ruled Nepal for 104 years (1847-1951). They never thought of development and it was not their issues of priority. They thought of themselves and their family. How to get more power and who to make their heir was their basic interest. Of course, they made huge European style buildings for their own use and entertainment. Some of the development-oriented works were- 500 KW Pharping Power Plant in 1911, Trichandra Campus in 1917, Durbar High School in 1914 and Bir hospital in 1865, Nepal Bank Limited in 1937 B.S. etc. Whatever they did is for their own use not for people's welfare. After the abolishment of their rule, their buildings are used for office of government agencies, which is remarkable contribution of *Rana* regime for the nation.

Instability started together with the dawn of democracy in 1951. In this period, the first public budget of 1952 was the major step for economic development. Except this, there were some administrative reform initiatives in this era. When *Tanka Prasad Acharya* became prime minister of Nepal, he initiated some major steps for economic development. The first five years plan in 1957, establishment of central bank in 1957, diplomatic relationship with northern neighbor China is some impressive works for Nepalese economy. After this King *Mahan-*

dra, establishing totalitarian *Panchayat* system dethroned the elected government of *Nepali Congress* led by *Bishweshwar Prasad Koirala* in 1961. This system worked for 30 years until 1990. During this era, there was political stability but not much committed development efforts. The land reform act of 1964 was theoretically good effort but the implementation part was poor with huge pressure from elite groups (Regmi, 1976). Decentralization, settlement programs in *Terai* region, return to local communities, agriculture and rural development were some programs brought for the stability of *Panchayat* System without proper implementation. In 1975, King *Birendra* proposed Nepal as peace zone in the international arena but it was also compelled to failure because the immediate neighbor India did not approve this proposal. "Nepal in the Asian standard" was a popular slogan at around mid-eighties but it also failed due to the lack of supporting programs.

The Political change of 1990 restored the multiparty democratic system in Nepal. This change has shaped some sectors in development. The country entered to the era of economic liberalization in this time. Most of the regulated policies changed to liberalized policies. After economic liberalization, Nepal became the most liberalized and investment friendly country in South Asia. The financial sector quantitatively gained in this time. Tax system was reformed from management assessment to self-assessment system, value added tax was introduced; privatization of public enterprises, private investment in media, telecommunication, airlines, education and health sectors were flourishing in this period. Quantitative progress was remarkable but quality is still low in these sectors. These initiatives gave people some feeling of change but what was lack in this era too was the investment in employment generating productive sector. Industry and manufacturing sector could not boom in this period too, which hampered the development process of Nepal. This is why? Because of the activities of political parties such as labor strikes, there was political instability causing establishment of new industries. The government led by *Girija Prasad Koirala* in 1991 could not run its full term due to many scandals and internal debates. The country faced mid-term election, which made the country politically unstable until now.

The Maoist started so-called people war in 1996, which continued until 2006. At these 10 years, there was political instability and deterioration of peace and security in the country by both the insurgents and the state. The royal massacre of 2002 and takeover of King *Gyanendra* in 2005 were also the dreadful circumstances in Nepalese politics. The people's movement version 2 of 2006 caused the downfall of the monarchy in 2007 but the country still could not find proper path of development due to failure of political parties to formulate new constitution and forming new stable government. These distressing situations cracked the country in further instability putting the nationals in an enormous disappointment.

At present, the economic agendas are kept in shadow intentionally by so-called self-centered dirty politics and the productive sector is almost dead. Parties, local communities, ethnic groups etc. are aware about their self-centered rights but not aware to respect others rights and no broader consensus towards nationality and national welfare. Everywhere we can see only three Ds (debates, divisions and deteriorations). As mentioned by Banerjee and Duflo (2011) this all is due to three Is (ideology, ignorance and inertia) which are equally the real impediment for Nepalese economic development.

3. COMPARISON TO THE GLOBAL CONTEXT

We can compare the economic situation of some countries based on statistics. Nepal is very rich in terms of culture, ancient civilization, languages and ethnicity but still ranked as poor country. Due to poverty and lack of employment opportunities inside country, a remarkable population is in abroad not only in developed world but also in rapidly developing world such as Malaysia, Qatar, Saudi Arabia, and United Arab Emirates. Non-skilled labors are working in low salary in these gulf countries. If we had employment opportunities within country, no one would have gone abroad in low salaried jobs. According to World Development Reports 1990 and 2012, we can extract the facts presented in table 1.

Selected development indicators of Nepal and her neighbors-Bangladesh, India, Pakistan, Sri Lanka and China are shown in table 1. This table further reveals the progress as where these countries were before 22 years and where are they now. Population below \$1.25 per day poverty is highest in Nepal (68.4 %) and lowest in Sri Lanka (14.0%). In this table, we can clearly see correlation between adult literacy rate and gross national income (GNI per capita), as literacy rate increases, income has also increased. Nepal is getting back to all in 2012 particularly in GNI per capita though was not bad as compared to Bangladesh in 1990.

If we see GNI per capita, in 1990 Sri Lanka had highest of \$420 and Bangladesh had lowest of \$170 among these six countries. Nepal was better than Bangladesh but worse than other four countries. The scenario is completely changed in 22 years, China has the highest of \$4,260 and Nepal has lowest of \$490 in 2012. Sri Lanka and India are also doing well but rests are in slow pace and Nepal is the least. Still the growth rate of per capita income is very slow in Nepal. If we see other indicators such as adult literacy rate and life expectancy at birth, Nepal, Bangladesh and Pakistan are in similar pace but others have better performance.

Table 1: Selected Development Indicators of Nepal and Her Neighbors

S. N.	Country	Poverty (below \$1.25)	GNI per capita \$	Adult Literacy	Life Expectancy	GDP Growth
1	Bangladesh 1990 2012	- 57.8	170 640	27 67	51 56	0.4 4.4
2	India 1990 2012		340 1,340	37 63	58 64.5	1.8 8.3
3	Nepal 1990 2012	- 68.4	180 490	19 59	51 67	0.6 2.5
4	Pakistan 1990 2012	- 22.6	350 1,050	25 56	55 67	2.5 2.1
5	Sri Lanka 1990 2012	- 14.0	420 2,290	85 91	71 74.5	3.0 7.2
6	China 1990 2012	- 28.4	330 4,260	62 94	70 73.5	5.4 9.7

Source: World Development Report 1990 and 2012 (World Bank, 1990 & World Bank, 2011)

Here we can focus on GNI per capita and further analyze some simple but interesting facts about Nepal in comparison to other neighbors. As of 2012, Nepal has per capita GNI of \$490, which is the lowest among neighbors. GNI per capita is \$ 640 for Bangladesh, \$ 1,340 for India, \$ 1,050 for Pakistan, \$ 2,290 for Sri Lanka and \$ 4,260 for China. Authentic statistics of Bhutan is not available but with the slogan of "Gross National Happiness" Bhutan is far ahead than our nation. If we consider Afghanistan and some other African countries with severe war, they might be behind us; however, most of the other developing countries are also ahead of us.

The average GDP growth of Nepal in the last five years is around 4%. Based on 4% of growth rate, the doubling time for Nepalese economy is about 18 years, which means, in 2030, per capita income of a Nepali will be \$ 980. In terms of GNI per capita, if we have the same pace as of present, we will reach the current position of Bangladesh after 11 years, current position of Pakistan after 19 years, current position of India after 24 years, current position of Sri Lanka after 42 years and current position of China after 78 years. Before 22 years, Bangladesh was behind us but now we are behind Bangladesh. This means that the development model and pace of Nepali economy is not correct. These facts suggest that Nepal is far behind to raise per capita income in her neighbors' standard and we are already very late to think about the future generation.

Natural resources, human resources and technology are very important factors for economic development. The development of resourceful countries will be easier and relatively sustainable. In this context, Nepal is a prosperous country in resources. We have everything but not the access to ocean. We have human resource, natural resource and we can purchase technology that can best fit our needs. If we think positive, no access to sea and ocean is also an opportunity of not being suffered by tsunami and hurricanes. We can demand the rights of land locked countries according to the prevailing international laws. We have great possibilities of tourism. We can use our potentiality of hydropower in industrial development. The geographical diversities and cultural diversities are great opportunities for tourism development that we can cash them. We can use diversities for national benefit and lessen differences. We can build deluxe hotels and recreation centers for tourist as a great source of revenue. We can make many places focusing to rich tourists for religious tourism, cultural tourism, scenery viewing, biological diversity viewing, world heritage sites viewing and holiday centers.

We can make *Terai* as the center of commercial agriculture, *Hills* as center of horticulture and vegetables and *Mountains* as tourism centers. Managed settlement in urban areas, dense housing development in certain places of rural areas and suburb as the junction between rural and urban areas, as industrial hub would be great steps for development. The government should invest in infrastructure development and the private sector should invest for productive and employment generating industries.

4. A NEPALI MODEL OF DEVELOPMENT

We need a unique Nepali model of development that can make optimum use of natural and human resources of the country in sustainable manner. For this, we have to make a long-term economic development plan, which would clearly fix the targets of income and employment with targeted growth rate to reach in developed countries' level in certain span of time. All of our attempts should be put to achieve these goals in national level. We have to set up a supervisory mechanism, which would work as a watchdog for misuse of resources and would successfully reduce level of corruption. A combination of economic, institutional and social policies can effectively, in turn, reduce and lower the effects of corruption on the society (Saha & Gounder, 2012). Learning from our own experiences in the process of development, we can improve our model and focus it to achieve the long-term development goals.

Let us talk here about a hypothetical model for development of Nepal entitled- "Nepalese Visionary Model of Development for 50 years (2015-2065)". For this, we have to set some assumptions as shown in box 1. This model holds only if these assumptions work.

Box 1: Ceteris Paribus Conditions

- New constitution and stable government by the end of 2014 A.D.
- Maintenance of peace and security with no strikes at all
- All parties consensus in the economic issues
- All parties keep their promise of making the country rich and prosperous
- Democratic institutions with healthy competitive political environment
- Strong law and order situation
- No any discrimination to any citizen
- All segments of the society are ensured to take part in development
- Long term development is national concern for all

Source: Author's viewpoint

A brief concept of "Nepalese Visionary Model of Development for 50 Years (2015-2065)" is presented in box 2. This is a hypothetical model and it tends to show that if we are committed for long-term development, nothing is impossible. The Nepalese experts around the globe can suggest their creative ideas to build the nation in a much-planned way. The economists, engineers, doctors, planners, policy makers, advocates and any citizens of Nepal can use their expertise to create better model. As mentioned by Justino (2006), collective actions contribute toward increased economic development; therefore, we also need collective actions such as-a lot of homework and interactions before finalizing such models. If necessary, we can hire foreign experts to support its technical part. The model presented here is to show the example of how should we have to work in a clearly planned way to develop our nation.

The main goal, focus, initial and targeted growth rate, targeted per capita income, reference level of income and special declaration are listed in each of the three stages. In the 20 years of first stage of development, priority should be given for structural transformation of economy from agriculture to industry. In 20 years of second stage, focus is given for high tech industries and the service sector. In 10 years of third stage, professional development of service sector is the priority. In this model, the economy passes through primary agricultural sector to secondary industrial sector and then into tertiary service sector. Since value add is higher in industrial sector than in agricultural sector and is higher in service sector than in industrial sector, the developed countries utilize their resources more in service sector. This model is intended to start in 2015, therefore, before 2015; we need to make a good constitution and stable government. All of the rest sectorial policies such as-agricultural policy, hydropower policy, tourism policy, employment policy, commerce and trade policy, foreign aid and investment policy, technology transfer policy etc. should be clearly supportive to this model. The budget of each year should propose programs in accordance with the line of this model to make it a success. The political commitment to support this model without any impediments is the most. Let us discuss the each stages of this model.

First Phase (2015-2035): No Poverty After 2035

The first phase of long-term planned visionary development model starts in 2015 AD just after the formation of stable government in the country. Since we are in pre-take off conduction at present, we should take off in this stage. How to transform Nepalese economy from agriculture to modern sector is the focus with a goal of no poverty in the country at the end of this stage. For structural transformation of economy, we need successful land reform initiatives in the beginning of this stage. Consolidation of land, improvement in technical efficiency of farmers, educating them, is necessary. If land reform is successful, then we can proceed to commercialization of agriculture. The government should invest in infrastructure and the private sector to produce high value added output from agriculture with the use of modern technology. Based on geographical diversity of the country, research and development of high quality agricultural products which can get high value in market and profitable to farmers should be done in this stage. Moreover, we need to produce high quality agricultural goods, which should be competitive in international market supporting agro-based industry. Sub urban areas should be developed as the meeting point of urban and rural areas with a good industrial hub.

Box 2: Nepalese Visionary Model of Development for 50 Years (2015-2065)

First Phase (2015-2035)

Main Goal: No poverty in the country after 2035

Focus: Land Reform, Commercialization of Agriculture, Structural Transformation of Economy from Agriculture to Industry, Education and Health

Economic Growth Target in Initial Years- 5%

Economic Growth Target in 2035-10%

Target of Per Capita Income in 2035: \$ 4000-\$4500

Similar to Current Level of Per Capita Income: China, Thailand

Special Declaration: No Free Grant to Nepal after 2035, Middle Income Country
(20 Years)

Second Phase (2035-2055)

Main Goal: Industrial Development

Focus: Comparative Advantage Sector, Nepali Brands

Economic Growth Target in Initial Years- 10%

Economic Growth Target in 2055- 8%

Target of Per Capita Income in 2055: \$ 15,000-\$20,000

Similar to Current Level of Per Capita Income: Saudi Arabia, Czech Republic

Special Declaration: High Income Country
(20 Years)

Third Phase (2055-2065)

Main Goal: Service Sector Development

Focus: High Value Added Services

Economic Growth Target in Initial Years - 8%

Economic Growth Target in 2065-6%

Target of Per Capita Income in 2065: \$ 30,000-\$35,000

Similar to Current Level of Per Capita Income: Japan

Special Declaration: Developed Country
(10 Years)

Source: Author's Viewpoint

Nepal will not be developed keeping an unmanaged urban areas as of present. Therefore, sustainable urbanization with all infrastructures is a must. Sparse rural settlements need to be transformed to densely settle small and planned towns with all infrastructures. The empty rural areas need to be converted into national parks, forest areas or diversified tourist areas. Rural areas need to be developed and rural tourism with home stay programs should be implemented in high potential touristic villages. Current industries should be upgraded and new high tech industries should be established providing employment to wider spectrum of skilled labors. Massive establishment of industries and commercialization of agriculture would increase employment opportunities in the country and would stop Nepalese to go abroad as unskilled labor in low salaried jobs. As suggested by Pyka & Andersen (2013), creation of new sectors for employment is necessary for developing countries to accelerate economic growth.

Investment, saving, and international capital flows are very important for economic development (Castro, 2005). Therefore, we can mobilize domestic saving, foreign grant and foreign loan in this stage. Facilitation by government, private sector's initiation and involvement in development, and public private partnership (PPP) model can be applied. Making large investment in development works, our target should be to achieve 5% growth of economy in the initial years reaching to 10% in the last year with targeted per capita income of \$4,000-\$4,500 in 2035. At the last of this stage, we could reach in the income level of current China or Thailand. We would come out of poverty in this stage; therefore, we need to declare that we would not receive any free grant for development from 2035 because we would already have been a middle-income country (MIC).

As education and health are very important factors for human resource, a successful policy requires an early focus on human development, not only because of its direct impact but also because of its feedback effect on sustaining economic growth. Human resource not only plays an essential role in determining growth trajectories but it is also a critical input into economic growth (Suri et al., 2011). The country should provide scholarship for brilliant students in different disciplines, from her annual budget, to go abroad, study, and bring knowledge for the country. Transfer of knowledge is very important for development. If we analyze the data, we come to realize that the country with higher level of average schooling have higher level of income and higher level of development. Therefore, our nation also must invest in human resource development. We need to make our institutions (political and economic) highly transparent, democratic with high respect in law and order, human rights, inclusive to women and people with disabilities. At this stage, we have to ensure that our country is a non-discriminatory towards any citizens not only in policies but also in real practices.

Second Phase (2035-2055): Industrial Development

The second phase starts in 2035 AD just after the first phase. Industrial development is the main goal of this phase. We have to develop high tech industries and high value added service sector together with highly skilled human resources in this stage. The surplus human resources in agricultural sector due to mechanization of agriculture in first phase will be trained and brought to industrial sector. Due to the development of infrastructure in first stage together with the investment environment, many investors will automatically come to invest in the country because they see security and profitability of their investment in this stage, which will further help to foster industrialization.

Identifying the sector of comparative advantage, we need to develop Nepali brands. The multinational companies will invest in Nepal because of the cheap labor compared to other highly developed countries. Then we can produce high tech branded goods in Nepali industries. For example, in this phase, we can produce Nepali branded computers, cameras, cars, and many electronic appliances in Nepali factories. We will fulfill domestic demand and export branded high quality products in the global market. We have to keep employment rate at full level and if necessary, demand cheap labor from other developing counties. Keeping the economic growth rate of 10 % in the initial years of this stage, should keep it as 8% at the end with per capita income of \$ 15,000-\$20,000. In 2055, we will reach the current income level of Saudi Arabia or Czech Republic. In the year 2055, we have to declare Nepal as high-income country (HIC).

Third Phase (2055-2065): Service Sector Development

The third phase starts in 2055 AD just after the second phase. The main goal of this stage is service sector development. Industrial sector will go towards maturity and service sector need to boom in this stage. We have to focus high value added services in this stage. Since at the final stage of development, the higher share in the economy will be of service sector in developed economy, we have to develop highly sophisticated services in this phase. We have to develop high quality professionalism in tourism, hotel, transportation, health and education sectors and attract foreigners to use our services. For example, in this stage, Nepali airlines will fly in the cosmopolitan-cities of USA and Europe and other developed countries with high quality services and loyal smiling staffs. Nepali hotels will be of world standards with high quality services. Touristic sports will be equipped

with high quality recreation centers, resorts, motels and hotels for tourists that attract higher spending tourists from all over the world.

Since the value add is highest in service sector, the development of this sector will certainly bring prosperity in Nepalese economy. Keeping at least the growth rate of economy at 6%, we will reach at the current income level of Japan with about \$30,000-\$35,000 per capita income at the end of this stage. Then we would be no more a developing country or no more a middle-income country or no more just a high-income country, rather will be developed country. Therefore, we need to declare Nepal as developed country in 2065.

5. CONCLUSION

It is not the geography, culture, weather or religion that is responsible for nations to fail but the human-made institutions. This is the conclusion of Acemoglu and Robinson (2012) and this proposition is equally important for Nepalese case too. We are going to the direction of failed nation at present because of our extremely awful institutions. Since, institutions are human-made; correction to them by bringing them in right way is possible.

If we correct our institutions such as political system, economic policies, law and order, civil societies, non-governmental organizations in a positive way together with preserving our values and social norms, we can foster the development of the country. If we have clearly defined objectives, targets, indicators, long-term clear plan and efforts, we can make our country a developed country in the map of the world. For this, we must realize that we are going in erroneous direction at present and we need to correct it as soon as possible. Making correction in our attitudes and establishing stable political system with well democratic cultures and values, we have to commence "Nepali Visionary Model of Development for 50 years (2015-2065)". As mentioned above, the model presented herewith is a hypothetical one but not impossible. Success of this hypothetical model is feasible only if we have real patriotism and commitment towards the prosperity of our nation.

However, already delayed in many periods, still we can cherish our development, making our country rich and peaceful. If a country is rich, people will be rich but vice-versa is always not true meaning that if some people are rich the country will not be rich unless the general people are rich. If our country is prosperous, we do not need to go abroad for employment as a cheap human resource. We can enjoy the benefit of development within our country celebrating our well-cultured festivals together with our families and relatives and we will feel proud to be a Nepali and having a Nepali passport. This all will be possible only with planned development efforts. If so, why not to start at earliest possible.

REFERENCES

1. Acemoglu, D., & Robinson, J. A. (2012). *Why nations fail: The origins of power, prosperity, and poverty*. New York: Crown Publishers.
2. Banerjee, A. V., & Duflo, E. (2011). *Poor economics: A radical rethinking of the way to fight global poverty*. New York: Public Affairs.
3. Castro, R. (2005). Economic development and growth in the world economy, *Review of Economic Dynamics*, 8, 1, 195-230.
4. Justino, P. (2006). The impact of collective action on economic development: empirical evidence from Kerala, India. *World Development*, 34, 7, 1254-1270.
5. Pyka, A., & Andersen, E. S. (2013). *Long-term economic development: Demand, finance, organization, policy and innovation in a Schumpeterian perspective*. Berlin: Springer.
6. Regmi, M. C. (1976). *Landownership in Nepal*. Berkeley: University of California Press.
7. Saha, S., & Gounder, R. (2012). Corruption and economic development nexus: Variations across income levels in a non-linear framework. *Economic Modelling*, 31, 70-79.
8. Suri, T., Boozer, M. A., Ranis, G., & Stewart, F. (2011). Paths to Success: The Relationship between Human Development and Economic Growth. *World Development*, 39, 4, 506-522.
9. World Bank. (1990). *World development report 1990*. New York: Published for the World Bank, Oxford University Press.
10. World Bank. (2011). *Gender equality and development: World development report 2012*. Washington, D.C: World Bank Publications.

APPLICATION OF FAST FOURIER TRANSFORMATION (FFT) IN FLOW VISUALIZATION TECHNIQUES TO DETERMINE QUANTITATIVE ANALYSIS OF PIPE FLOW

Kiran SHRESTHA

Graduate School of Science and Engineering, Saitama University,
255, Shimo-Okubo, Sakura, Saitama 338-8570, Japan, Email: kiran11471@gmail.com

ABSTRACT: The present paper deals with the methodology used to determine the quantitative analysis of an experimental investigation of instability of axially rotating pipe flow. Matlab module code is developed which is verified with virtual images for different wave patterns of known frequency and wavenumber. This verified module prepared is applied to real images from image processing of the videos taken during the experiment. All the analysis from the beginning of virtual images, spatio-temporal images and the determination of frequency and wavenumber of moving wave is done by the help of Fast Fourier Transformation (FFT) and technique of flow visualization. Flow visualization is done in small quantities of seeding particle Mermaid AA mixed with water to visualize as natural pearl essence on illuminating the flow. The flow through the rotating pipe is analyzed in the inlet section and far downstream of the pipe. At the inlet section of rotating pipe flow, sudden solid body rotation is introduced to the uniform flow where as a disturbance to the steady uniform flow and the flow is fully Hagen-Poisuille in the far downstream of the pipe section.

Keywords: Flow Visualization; Fourier Transform; Frequency and wavenumber

1. INTRODUCTION

The flow visualization is an experimental technique used to analyze the flow pattern around a body or over its surface. The flow is "visualized" by introducing dye, smoke or a pigment into the flow in the test section. The first advantage of such a method is to provide a clear description of the flow. This is useful to compare with theoretical models or numerical simulations without complicated data reduction and analysis. When a flow phenomenon is described by a model, this model of the flow should be compared with the 'real' fluid flow by means of experimental data.

2. FOURIER TRANSFORM

The image processing is any form of digital processing for which the input is an image, e.g. a photograph or a video frame. The output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

Fourier analysis is used in the image processing to compute the frequency of the images. Jean Baptiste Joseph Fourier presented his results related to the heat propagation and diffusion in 1807 (Narasimhan, 1999). He claimed during his presentation that any periodic signal could be represented by a series of sinusoidal waves. Though initially this concept was not accepted by the scientific community, it was later used in several developments in mathematics, science, and engineering. This concept is the basis for what we know nowadays as the series of Fourier.

2.1 Discrete Fourier Transform

The functions are generally defined continuously. However, digital images must be processed as a function of a discrete set of points. Thus, using the *Discrete Fourier Transform* (DFT), the equations are similar to those for the continuous Fourier transform. Consequently, the features of images (frequency and wavelengths) can be obtained. For that purpose, DFT transforms one function into another, which is called the frequency domain representation, or simply the DFT function, of the original function, which is often a function of time. But the DFT requires an input function that is discrete and whose non-zero values have a limited (finite) duration (Sabin, 2008).

Consider a complex series $x(k)$ with N samples of the form $x_0, x_1, x_2, x_3, \dots, x_k, \dots, x_{N-1}$ where x is a complex number i.e. $x = x_{\text{real}} + j x_{\text{imag}}$. Furthermore, assume that the series outside the range 0, $N-1$ is extended N -periodic, that is, $x_k = x_{k+N}$ for all k . The FT of this series will be denoted $X(k)$, it will also have N samples. The forward transform will be defined as the following equation:

$$X(n) = \frac{1}{N} \sum_{k=0}^{N-1} x(k) e^{-jk2\pi n/N} \quad \text{for } n=0\dots N-1 \quad (1)$$

The inverse of the transform will be defined as,

$$x(n) = \sum_{k=0}^{N-1} X(k) e^{jk2\pi n/N} \quad \text{for } n=0\dots N-1 \quad (2)$$

2.2 Signal and Spectrum

To better understand the results of the flow visualization, we review here some of the basic aspects related to the signals (waves), that can be obtained after analyzing the pictures taken experimentally. Thus, the following paragraphs are a summary of the basics of fundamental physics.

A wave is any time-varying or spatial-varying quantity which is measured through time or space (Ingle & Proakis 2011). Fig. 1 shows a plot of a simple sine wave as a function of time. These kind of waves corresponds to audio, or electromagnetic signals.

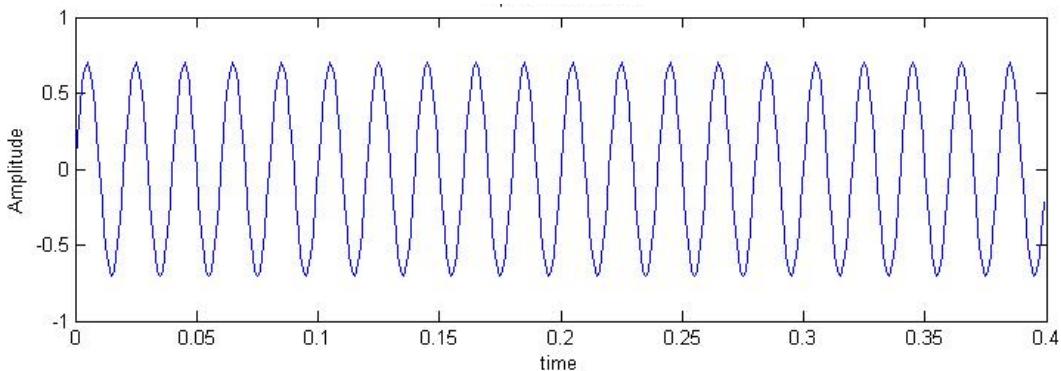


Fig.1 Sine wave with a constant amplitude and one frequency

The spectrum of a wave contains the information of every frequency added to the original (main) wave. An estimation of the weight of a specific frequency in the whole signal can be determined (Sabin, 2008). Since the wave shown above is a sine, it has only one frequency. Only one value for the frequency is positive, and the rest of frequencies are equal to zero. In this case, the spectrum has a single peak. This is depicted in Fig 2. As it is observed, the spectrum has two sides: the negative side on the left, and the positive side on the right. The negative values, present in real audio signals (with no imaginary part), is always a mirrored (symmetric) version of the positive side. So, for the sine signal, the positive side has a single peak, and this peak will be mirrored in the negative side as shown in the fig. 2.

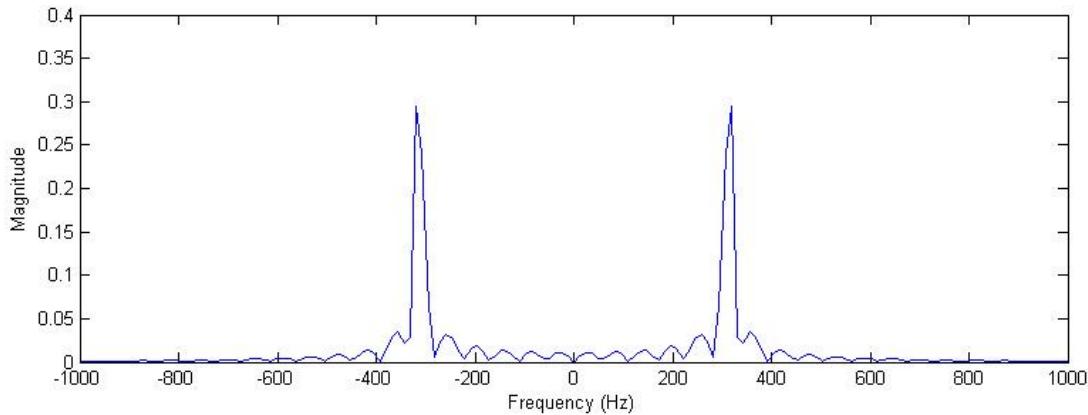


Fig.2 The spectrum of the wave shown in Fig 3

A constant component (C) could be added to the same sine function $[\sin(\omega t)+C]$. A sine wave has an amplitude average in time equals to zero. Adding a constant to the sine function, the average amplitude will become the constant C imposed. The result of adding a constant C (offset) in the sine function is to increase to a high level the amplitude as it is depicted in fig. 3.

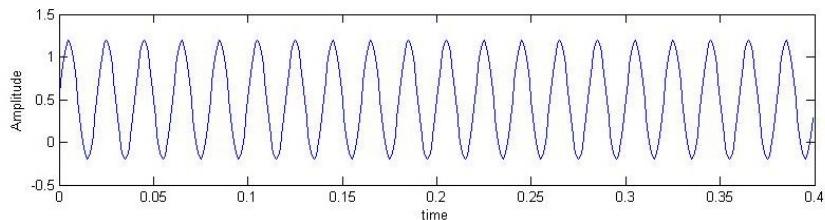


Fig.3. A plot of sine wave with DC component

The continuous component will give a zero frequency of the original wave. Then, the spectrum will get an extra peak at the origin, as shown in fig. 4. For this reason, a spectrum of a signal with a zero peak at the origin means the signal analyzed has got a constant component. As we move to the left or to the right further, the values of the frequencies increase, so high frequency component can be found.

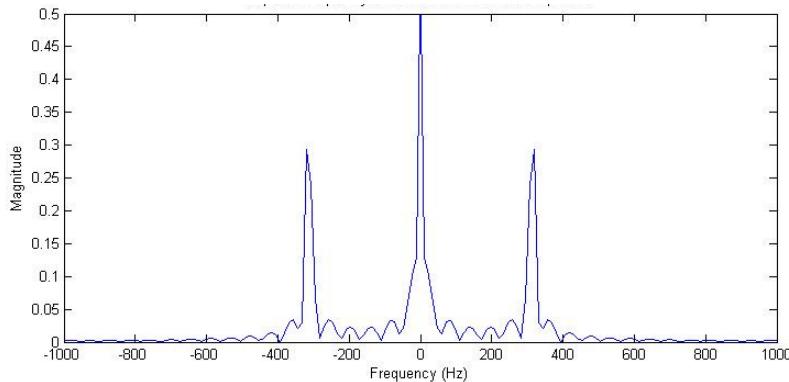


Fig.4 The frequency spectrum of a sine functions with DC component and 300 Hz.

Fig. 5 shows a plot of the case of two sine functions with the same amplitude, but adding two different frequencies. The final plot represents the result of this addition as a function of time.

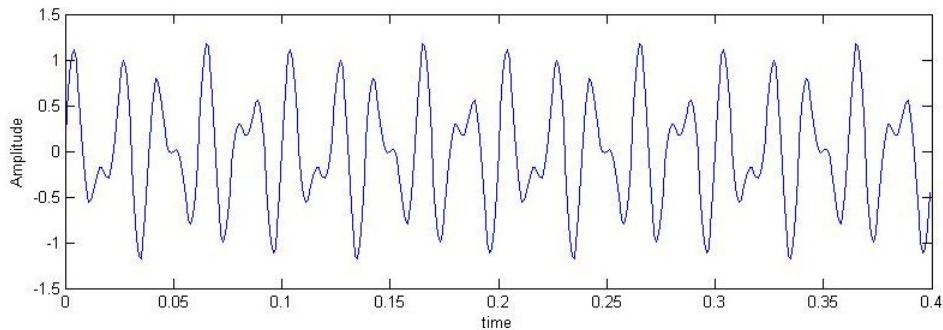


Fig.5 A sine function with two different frequencies.

One sine function with two different frequencies gives two peaks on the positive side of the spectrum and two more on the negative side as the (symmetric) mirrored of the positive spectrum. This is shown in fig. 3.6.

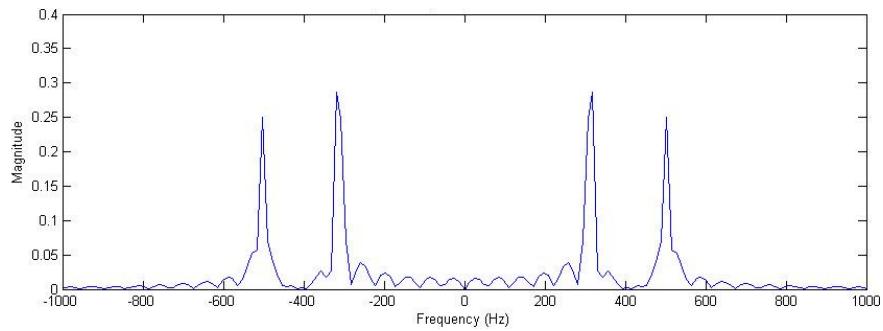


Fig.6 Spectrum of one sine function with two different frequencies.

The extension of the Fourier Fast Transformation from 1-D to 2-D is useful in the case of flow visualization. The main objective is to obtain both frequencies and wavelengths by applying one simple code to the frames extracted from the video. A two dimensional signal represents the intensity variations in space while one dimensional signal represents changes in time (Brigham and Morrow, 1967). These signals come in the form of images. The Fourier transformation of an image converts the information in the spatial domain into a disordered form

in the frequency domain. The images of the experiment are digital. Thus, they have a finite width and height in pixels. It is assumed that the pixels have got a real number value.

2.3 Fast Fourier Transform (FFT)

The FFT is a faster version of DFT but using optimized algorithms to do the same operations in less time (Brigham and Morrow, 1967). The DFT is extremely important in the area of the frequency (spectrum) analysis. Basically, DFT takes a discrete signal in time domain and then it transforms that signal into the discrete frequency domain representation. Fourier transforms cannot be computed without discrete-time to discrete-frequency transformation. The main objective is to obtain both the frequencies and the wavelengths by applying one simple code to the frames extracted from the video.

The spatial frequency of an image is the rate at which the pixel intensities change (Webb, 2004). Fig. 7 shows an image consisting of different frequencies. The high frequencies are concentrated around the axes dividing the image into four quadrants. High frequencies are noted by concentrations of large amplitude changes in the small checkerboard pattern. The corners have lower frequencies. Low spatial frequencies are noted by large areas of nearly constant values. This example is useful to explain the results of the 2-D FFT applied to the images of the flow visualization.

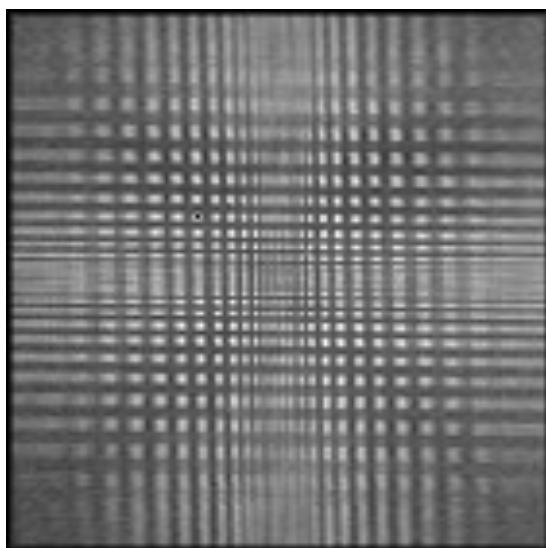


Fig.7 Image of varying frequency

2.4 Verification of a MATLAB code for image processing

In order to create a virtual image, or a wave moving from left to right, a mesh grid is developed with spatial variation from -10 to 10 unit variation in the x-axis domain where as variation is -1 to 1 unit variation in the y-axis domain. Similarly, for the time domain the variation is done from 0 to 9.9 units. Thus, virtual images are developed following the equation $\cos(k1*x + k2*y - \omega*t)$. A 3-dimensional view of the wave generated from this equation is shown in the left side of fig. 8.

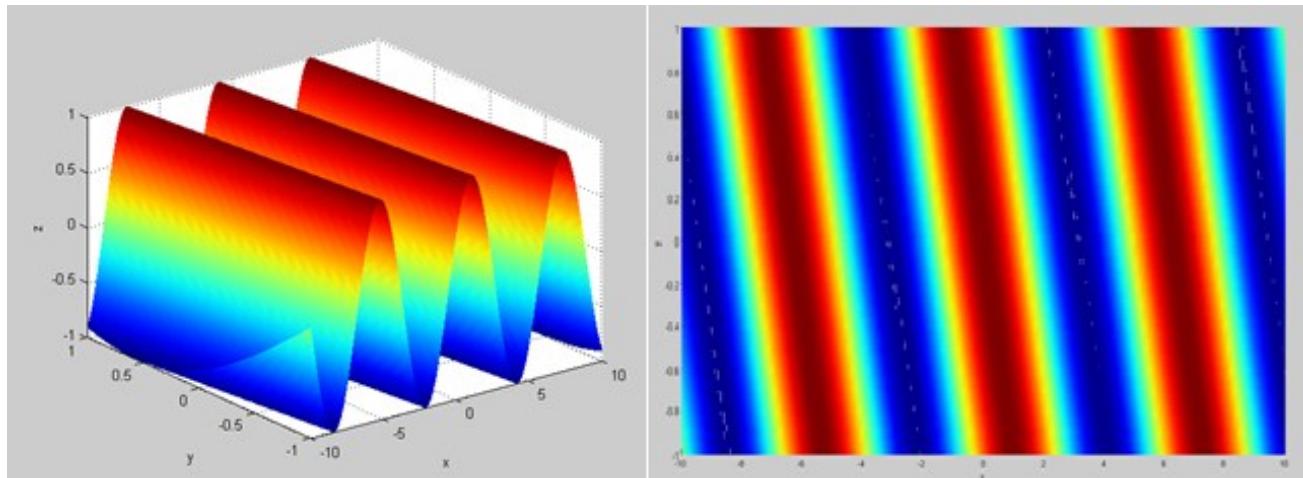


Fig.8 3-D and 2-D view of a virtual image.

The two dimensional discrete virtual images are generated from three dimensional discrete virtual images with a z-

axis point of view. This is shown in the right side of fig. 8.

2.5. Wave Travelling from Right to Left

Virtual images are later processed. Thus, a horizontal line in the center (axis) of the images, that is to say, $y=0$ and $x=[-10,10]$. These images for $y=0$ are located chronologically to build a final image in a (x,t) -plane. The final image obtained after this step is depicted in fig. 10. This will be very useful in the case of the experiments, because a spatial-temporal image gives us enough information to determine the nature of the waves observed.

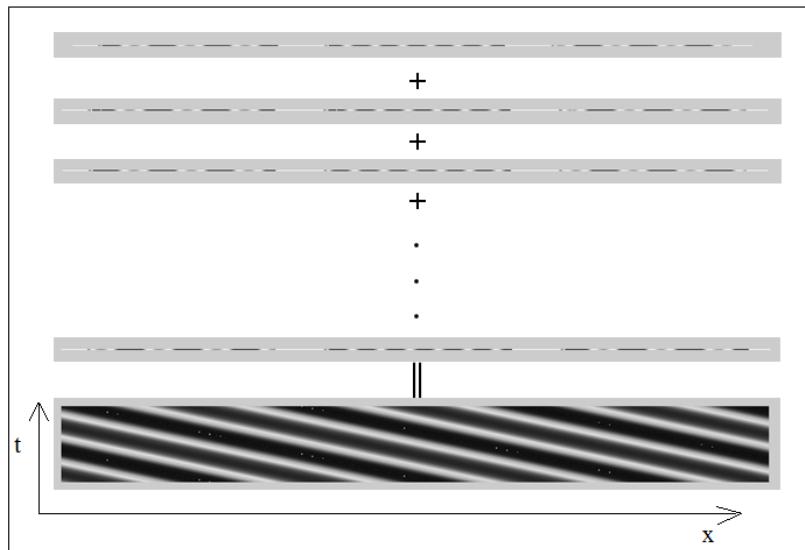


Fig.10 Development of virtual images for known values of k_1 , k_2 and ω in a (x,t) -plane.

A proper analysis is required for the real value problem of the virtual images generated. Take into account that the size of the images is 100×931 pixels. The discrete y-axis (time) varies from $0: 9.9 / (100-1) = 9.9$ whereas the discrete x-axis (distance) sampled varies from $0: 20 / (931-1) = 20$. This step is basic to convert pixels into real measures. In other words, we need to calibrate the digital images generated in pixels to obtain results with real values.

The code developed in Matlab is verified by both 1-D and 2-D FFT methods.

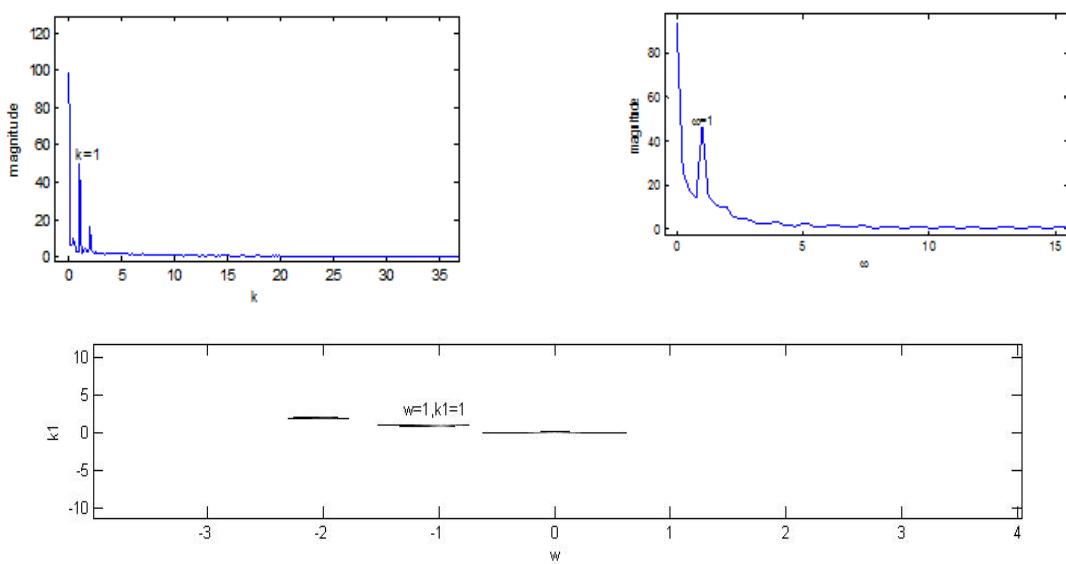


Fig.11 1-D and 2-D FFT Result for wave number, $k=1$ and frequency, $w=1$

2.6 Wave Travelling from Right to Left

The procedure to generate virtual images travelling from right to left is the same as it was commented above. One can change the sign of the function $\cos(k_1*x + k_2*y + \omega*t)$. The processed images generated for the same values of k_1 , k_2 and ω are shown in fig. 12.

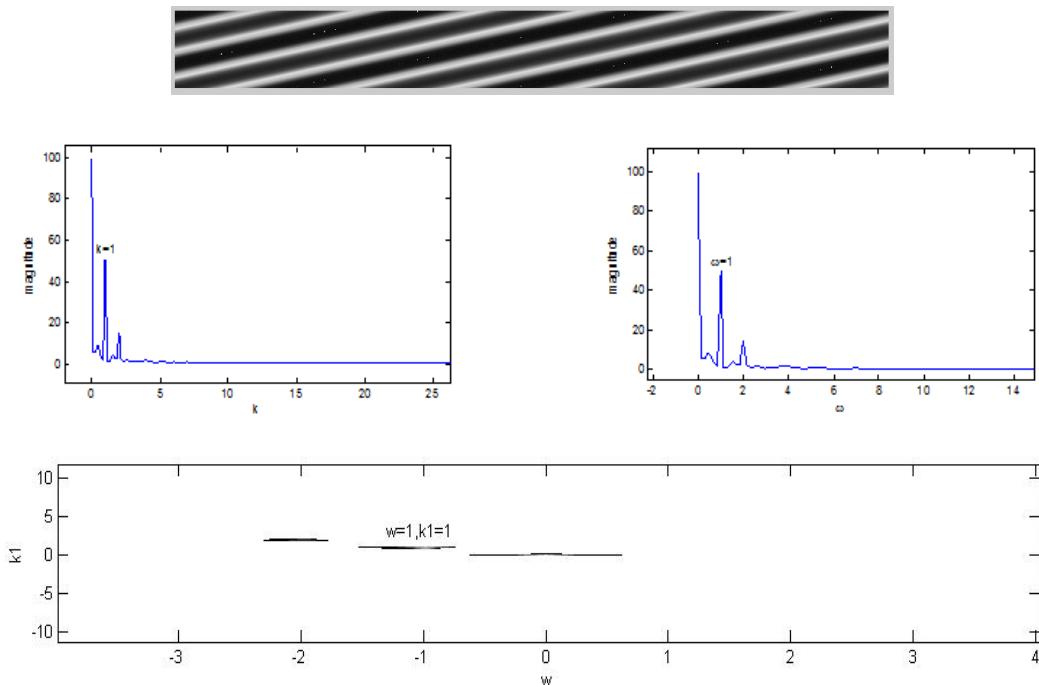


Fig.12 Virtual image with 1-D and 2-D FFT Result for wave number, $k=1$ and frequency, $w=1$

2.7 Waves Travelling in Both Directions

The procedure to generate virtual images of waves travelling in both directions is again very simple. We have to add both equations, the one of the wave travelling from left to right and the other travelling from right to left. The final expression is $\cos(k1*x + k2*y + \omega*t) + \cos(k1*x + k2*y - \omega*t)$. The processed images generated for different values of $k1$, $k2$ and ω are shown in fig. 13.

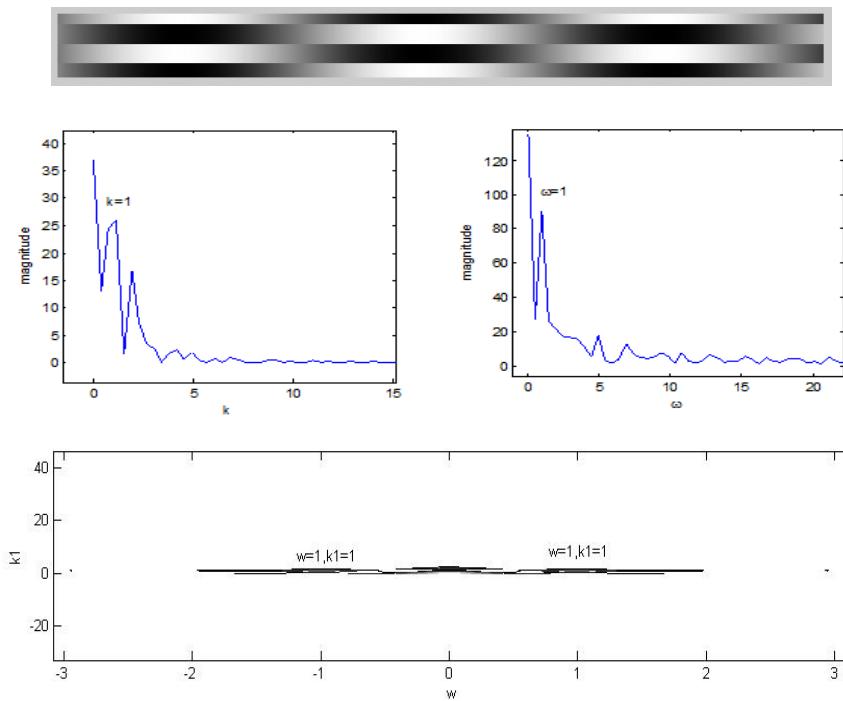


Fig.13 Virtual image with 1-D and 2-D FFT Result for wave number, $k=1$ and frequency, $w=1$

In the case of two dimensional FFT, more than two islands will be appearing as an output result. To select the correct island (pair of values for the frequency and the wavelength), the criteria is to compute the maximum amplitude of the 2-D FFT. Note that the island close to zero belongs to the noise or constant amplitude present in the virtual images. After the 2-D FFT, it is possible to confirm that the values are again in agreement with those im-

posed in the virtual waves. Consequently, we guarantee that in both the 1-D and 2-D FFTs , the results of a wave travelling from left to right, right to left and from both directions are correct.

3. FLOW VISUALIZATION FOR INLET SECTION OF ROTATING FLOW PIPE

The experiments were carried out for different Reynolds number (Re) for different values of the swirl parameter (L). Fig. 14 shows photographs of the inlet section of the flow at Re= 246 and 415 for different swirl parameters. The flow travels from left to right as it is shown by an arrow label. The direction of pipe rotation is clockwise. It may be observed that without rotation, the flow is laminar. As the rotation speed increases, the flow concentrates at the axis. This is clear in the picture, since two white lines highlight the flow pattern. This effect can be explained as follows: the effect of a rotating boundary layer in Hagen-Poiseuille flow in the inlet region is to accelerate even more the axial velocity at the axis. For this reason, the cone is observed in the flow. Increasing the rotation speed, the flow becomes unstable (a spiral is superimposed on the mean flow) and then the flow starts to oscillate. This process can be clearly observed in the pictures. The cone concentrated in the center suddenly break-down and the sinuous waves or spirals appear in the flow of certain values of the Reynolds number and the swirl parameter.

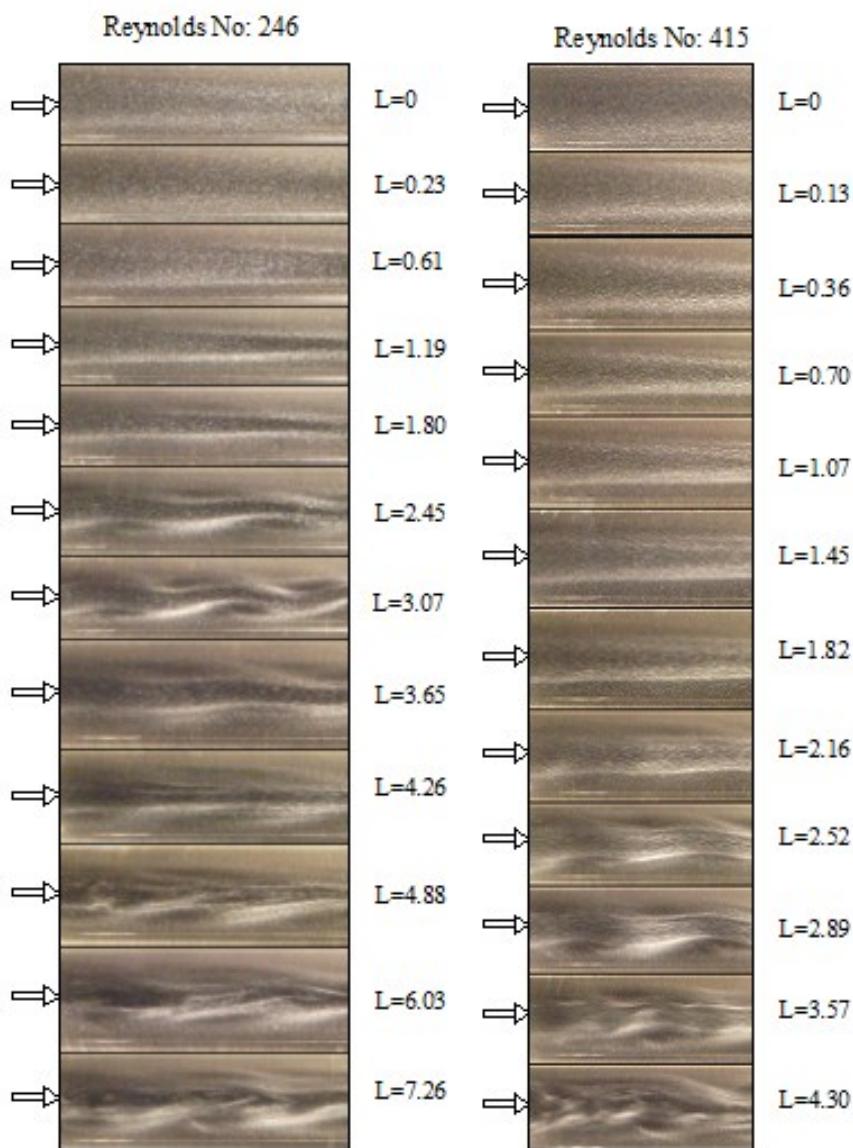


Fig. 14. Flow visualizations for Reynolds number, Re= 246 (left column) and 415 (right column)

3.1 Flow Visualization for Downstream of rotating pipe flow

Flow visualization in the downstream area is not as clear as in the inlet section. This is because longer wavelengths appear downstream, so it is more difficult to distinguish the flow patterns. Fig. 15 shows photographs of

the downstream section for fully developed Hagen-Poiseuille flow at Rotation =20 RPM for different Reynolds number.



Fig.15 Flow visualizations for constant rotation of 20 RPM.

In the fig. 16, the spatio-temporal diagrams for different values of the Reynolds number and the swirl parameter are . In this case, the transition from a stable to a convectively unstable flow is detected. At a fixed value of the Reynolds numbers, and zero rotation, the image obtained is a uniform color. As the rotation is increased, the (x, t) -plane seems to be almost uniform ($Re=70, L=3.38$). This is a consequence of the laminar flow or the steady state. At a critical Reynolds number, when the swirl parameter increases till another critical value, lines slightly tilted appear suddenly. Taking into account that we represent the lines that correspond to the axis of the pipe, the onset of these lines is the result of travelling waves that move downstream. With increasing the Reynolds number for the same rotational speed, these lines slowly tilt towards the right. That means the generated wave in the flow has positive phase velocity (from left to right). Increasing even more the Reynolds number, the lines suddenly change the sign of their slopes.

As the Reynolds number is further increased ($Re \geq 132$) for the same rotation rate (bigger swirl parameters), the lines in the (x, t) -plane changes their slope and they tilt towards the left.

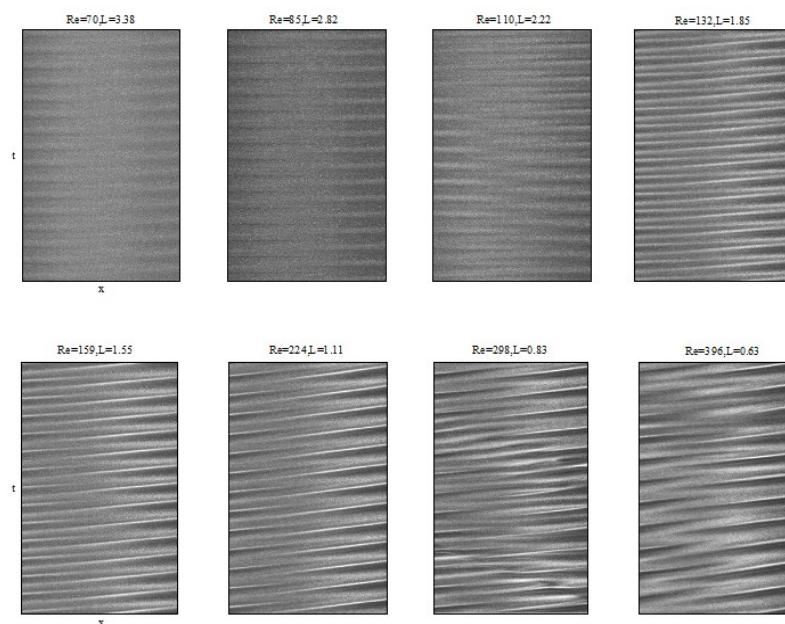


Fig.16 Spatial temporal diagrams $[(x, t)$ -plane] for different values of the Reynolds number and swirl parameters.

3.2 Results of 1-D FFT and 2-D FFT for the Downstream Section

The frequency (ω) and the wave number (k) of the unstable waves present in the flow are easily obtained with the one-dimensional and the two-dimensional fast Fourier transformations. These will be applied to the spatio-temporal diagram or (x, t) -plane. The Matlab code verified with the generated virtual images is used with the real experimental problems. To test theoretical results with the experimental ones, the frequencies and wave numbers are determined by 1-D and 2-D FFT in order to check the results from both ways.

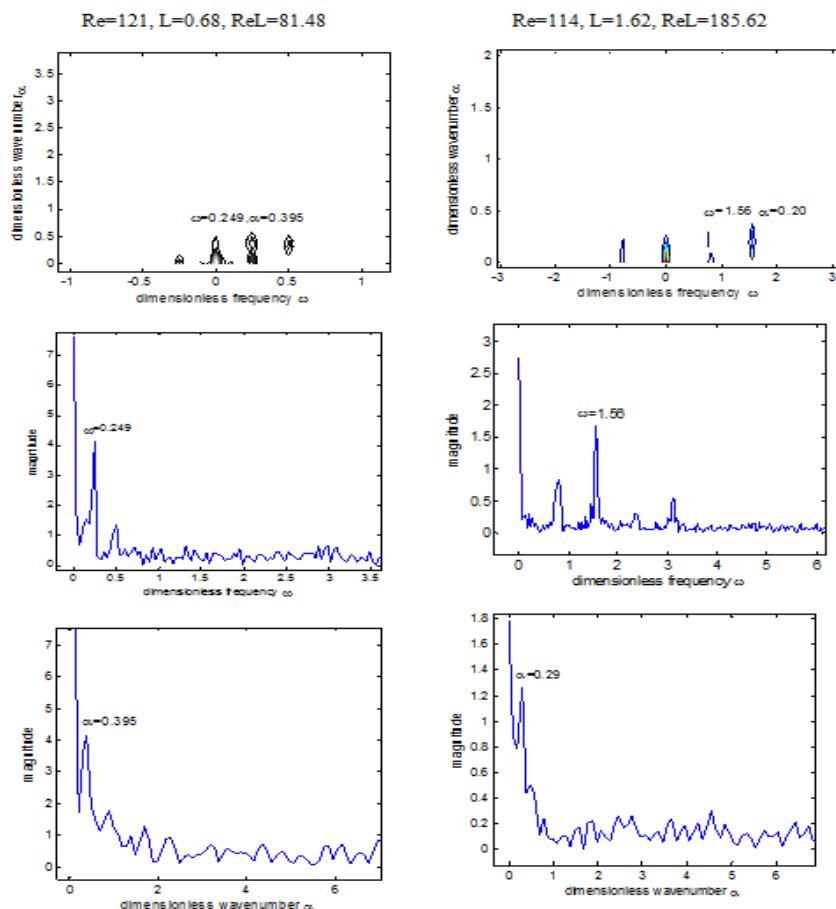


Fig.17 1-D and 2-D FFT for the spatial temporal images of real experimental problems

4. CONCLUSION

The analysis of flow visualization by one and two dimensional FFT is done to determine the quantitative analysis of the real problems of rotating pipe flow to find the frequency and wave number. The procedure for the visualization done in this study are explained in detail, which is a part of the procedure for experimental analysis which was published in the Journal of Fluid Mechanics (Shrestha et. al, 2013).

REFERENCES

- Brigham, E.O. & Morrow, R.E., 1967. The fast Fourier transform. Spectrum, IEEE, 4 (12), p. 63–70.
- Ingle, V.K. & Proakis, J.G., 2011. Digital signal processing using MATLAB, Cengage Learning.
- Narasimhan, T.N., 1999. Fourier's heat conduction equation: History, influence, and connections. Journal of Earth System Science, 108 (3), p. 117–148.
- Shrestha, K., Parras, L., del Pino, C., Sanmiguel-Rojas, E. And Fernandez-Feria, R. 'Experimental evidence of convective and absolute instabilities in rotating Hagen-Poiseuille flow', J. Fluid Mech., Volume 716 / February 2013.
- Sabin, W.E., 2008. Discrete-signal analysis and design, Wiley-Blackwell.
- Sundararajan, D., 2001. The discrete Fourier transform: theory, algorithms and applications, World Scientific Pub Co Inc.
- Webb, C., 2004. Method for providing image alignment feedback for panorama (composite) images in digital cameras using edge detection.

NONLINEAR BUCKLING BEHAVIOUR OF CFRP REINFORCED THIN-WALLED STEEL CYLINDERS UNDER LATERAL PRESSURE

Krishna Kumar BHETWAL¹, Seishi YAMADA², Yukihiro MATSUMOTO³
and Genki SADAOKA⁴

¹PhD Student, Dept. of Architecture and Civil Eng., Toyohashi University of Technology, (Toyohashi, Tempaku-ku, 441-8580, Japan), E-mail:b085605@edu.imc.tut.ac.jp

²Professor, Dept. of Architecture and Civil Eng., Toyohashi University of Technology, (Toyohashi, Tempaku-ku, 441-8580, Japan), E-mail:yamada@ace.tut.ac.jp

³Asst. Prof., Dept. of Architecture and Civil Eng., Toyohashi University of Technology, (Toyohashi, Tempaku-ku, 441-8580, Japan), E-mail:y-matsum@ace.tut.ac.jp

⁴Graduate Student, Dept. of Architecture and Civil Eng., Toyohashi University of Technology, (Toyohashi, Tempaku-ku, 441-8580, Japan), E-mail:g115502@edu.tut.ac.jp

ABSTRACT: This study deals with the buckling behaviour of thin-walled steel cylindrical shells subjected to the lateral pressure and the effect of the carbon fibre reinforcement polymer (CFRP) on it, when they are reinforced externally and internally. A nonlinear numerical experiment has been performed in this study and presents a novel way of strengthening thin-walled steel cylindrical shells during lateral pressure in which application of a small amount of the CFRP composite can increase the buckling strength effectively, when they are coated from the both side with the veneers of the CFRP. On the previous study, it has been pointed out that the CFRPs, when they are applied to the thin-walled cylindrical shells under compression have complex buckling behaviour which is very sensitive to initial geometric imperfections. In the case of the orthotropic CFRP material, the angles and dispositions of fibre orientations, as well as the magnitudes of any imperfections, have been suggested to affect the buckling behaviour. In this study, to obtain the valuable information for the design of the FRP based hybrid structural elements having the complex buckling collapse behaviour, the nonlinear numerical experiments have been carried out for the CFRP laminated reinforced thin-walled steel cylinders under lateral pressure. Also, in this research, the best angle of fibre orientations while CFRPs are sandwiched with steel in the case of laterally pressurized cylindrical shells has been studied and its action on the buckling strength as well as on the associated buckling mode, amplitude and imperfection modes adopting the symmetrical model for the analysis.

Keywords : Carbon fibre reinforced polymer, Cylindrical shell, Lateral pressure, Nonlinear numerical experiment, Initial imperfection

1. INTRODUCTION

Fibre reinforced polymer (FRP) composites, comparatively new and revolutionary class of composite material manufactured from fibres and resins, serves the constant demands of the society and is an effective material to achieve the impressive gains over high strength, light weight and safe economical structures. For years, civil engineers have been in search for alternatives to steel and its alloys to combat the high costs of repair and maintenance of steel structures damaged by corrosion and heavy use. Carbon fibre reinforced polymer (CFRP) is an alternate source of effective material which has the benefit of high strength to weight ratios along with corrosion resistance. In addition, several researches have shown that these CFRPs are ideally suited for short-term retrofits and long-term rehabilitations because of having merit of the ease of handling during construction with excellent durability in aggressive environments (Moy, 2001). Therefore; these composites are particularly suitable for the design of bridges, large span structural members, aerospace components and pressure vessels. Since steel shells are considerably stiffer than the CFRP composites, strengthening them requires expensive high-strength fibres and thus, this procedure has been generally deemed not advantageous. Despite this fact, El Damatty et al. (2003) have shown both experimentally and numerically, that glass fibre (GFRP) plates can be used to enhance the load-carrying capacity. Nevertheless, there is no doubt that CFRP are, of course, expensive and less processable than GFRP, but has predominant advantage of high stiffness. However, these composites have drawback having relatively lower stiffness driven by CFRP's. Consequently, serviceability rather than strength limit states tend to provide the controlling influence on design constraint in the context of thin-walled shell structures. So that the required buckling strength could not be obtained for the shells constructed just from CFRP only. In this case, a novel way to improve this drawback of CFRP would be, jointly use with thin-walled

steel plates. So that strength properties of the steel could be increased and possibility of corrosion inside the marine environments also would be vanished because the carbon fibres are chemically inert and have low surface energy. In this study, CFRP laminated thin-walled steel cylinders under lateral pressure are treated with nonlinear numerical experiment to obtain the valuable information for the design of CFRP based hybrid structural elements and discusses the influence of CFRP reinforcements to increase the load carrying capacity of the thin-walled metallic structures having complex buckling collapse behaviour. In the case of CFRP material, the angles and dispositions of fibre orientations, as well as the magnitudes of any imperfections, have been suggested to affect the buckling behaviour³⁾. Since, the mechanical behaviour of CFRP shells is much dependent upon the fibre orientation (Matsumoto et. al (2003), Betwal et. al (2009)) , the relative fibre orientation has been given priority for the analysis for $\theta = 0^\circ$ and $\theta = 90^\circ$. Also, in our previous study, it has been shown that for the axially compressed thin-walled CFRP reinforced steel cylinders, depending upon the imperfections, buckling modes as well as buckling load carrying capacity differs and this capacity varies with the adopted reinforcement together with the angle of fibre orientation (Betwal et. al, 2012). Therefore, in this paper, a nonlinear numerical experiment has been performed in the case of laterally pressurized CFRP reinforced steel cylinders to determine how best to alter the angle of fibre orientation.

2. METHOD OF ANALYSIS

2.1. CFRP Lamina and CFRP Reinforced Steel Lamination

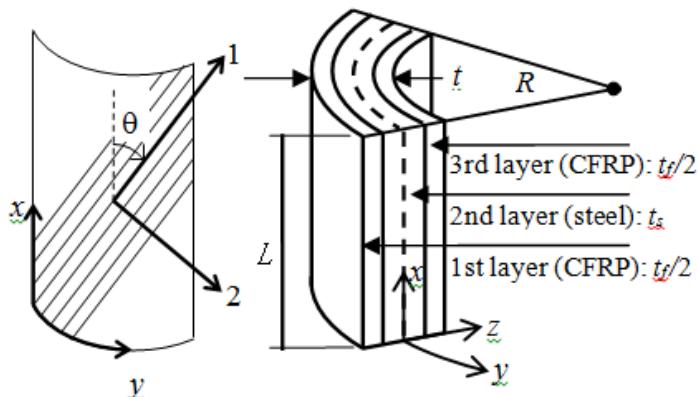


Fig. 1: Section of FSF thin cylindrical shell with angle of fibre orientation θ

As shown in Fig. 1 a section of thin-walled CFRP reinforced steel cylinder, which is termed as FSF-model (fibre steel fiber) is considered in which $x-y$ denotes the coordinate of thin cylindrical shell and 1-2 denotes the coordinates along fibre direction. The material constants are obtained by using Halpin-Tsai equation (Jones, 1999) as

$$\left\{ \begin{array}{l} E_1 = E_F V_F + E_P V_P, \mu_{12} = \mu_F V_F + \mu_P V_P, \\ \mu_{21} = \frac{E_2}{E_1} \mu_{12} \end{array} \right\} \quad (1)$$

In Eq.1 subscript F and P relate to fibre and polymer, respectively. E_1 represent elastic coefficient and E_F and E_P as elastic constants for fibre and polymer, respectively. Also, V_F and V_P represent volume fraction for fibre and polymer and μ_{12} and μ_{21} as Poisson's ratios. In Eq.1 E_2 is the elastic coefficient normal to the fibre and calculated as $E_2 = E_p (1 + \xi \eta V_F) / (1 - \eta V_F)$. Parameters ξ is taken as $\xi = 2$ and $\eta = \{(E_F / E_P) - 1\} / \{(E_F / E_P) + \xi\}$. Again, the shear modulus of elasticity G_{12} can be calculated as $G_{12} = G_p (1 + \xi \eta V_F) / (1 - \eta V_F)$ and the associated parameter ξ for the calculation of G_{12} is taken as $\xi = 1 + 40 V_F^{10}$ and η for the calculation of G_{12} is $\eta = \{(G_F / G_P) - 1\} / \{(G_F / G_P) + \xi\}$. The resulting transformed linear elastic constants after the transformation of the linear elastic constants from the principal material fibre directions to a global $x-y$ coordinate is as below

$$\begin{aligned} \begin{Bmatrix} \bar{\sigma}_x \\ \bar{\sigma}_y \\ \bar{\sigma}_{xy} \end{Bmatrix} &= \begin{Bmatrix} \bar{Q}_{11} & \bar{Q}_{12} & 0 \\ \bar{Q}_{12} & \bar{Q}_{22} & 0 \\ 0 & 0 & \bar{Q}_{66} \end{Bmatrix} \begin{Bmatrix} \bar{\varepsilon}_x \\ \bar{\varepsilon}_y \\ 2\bar{\varepsilon}_{xy} \end{Bmatrix} \\ &= [\bar{Q}_{ij}] \begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ 2\varepsilon_{xy} \end{Bmatrix} + z[\bar{Q}_{ij}] \begin{Bmatrix} \kappa_x \\ \kappa_y \\ 2\kappa_{xy} \end{Bmatrix} \end{aligned} \quad (2)$$

Where, $\bar{Q}_{11} \equiv E_1 / (1 - \mu_{12}\mu_{21})$, $\bar{Q}_{12} \equiv \mu_{12}E_1 / (1 - \mu_{12}\mu_{21})$,

$\bar{Q}_{22} \equiv E_2 / (1 - \mu_{12}\mu_{21})$ and $\bar{Q}_{66} \equiv G_{12}$, $(\bar{\sigma}_x, \bar{\sigma}_y, \bar{\sigma}_{xy})$ and $(\bar{\varepsilon}_x, \bar{\varepsilon}_y, \bar{\varepsilon}_{xy})$ are the principal stress and strain components associated with $x-y$ plane, and similarly, $(\varepsilon_x, \varepsilon_y, \varepsilon_{xy})$ and $(\kappa_x, \kappa_y, \kappa_{xy})$ are the corresponding membrane and bending strains on the middle plane of the shell respectively. Also, by integrating the whole thickness of lamina, the membrane and bending stress resultant matrices can be obtained as

$$\begin{aligned} \begin{Bmatrix} n_x \\ n_y \\ n_{xy} \end{Bmatrix} &= [A_{ij}] \begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ 2\varepsilon_{xy} \end{Bmatrix} + [B_{ij}] \begin{Bmatrix} \kappa_x \\ \kappa_y \\ 2\kappa_{xy} \end{Bmatrix} \\ \begin{Bmatrix} m_x \\ m_y \\ m_{xy} \end{Bmatrix} &= [B_{ij}] \begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ 2\varepsilon_{xy} \end{Bmatrix} + [D_{ij}] \begin{Bmatrix} \kappa_x \\ \kappa_y \\ 2\kappa_{xy} \end{Bmatrix} \end{aligned} \quad (3)$$

Where, (n_x, n_y, n_{xy}) and (m_x, m_y, m_{xy}) are the total membrane and bending stress resultants respectively. Similarly, A_{ij} , B_{ij} and D_{ij} are respectively the membrane, membrane bending coupling and bending stiffness respectively. From Eq. (3) the constitutive relation for the laminated plate can be calculated as

$$\begin{Bmatrix} n_x \\ n_y \\ n_{xy} \\ m_x \\ m_y \\ m_{xy} \end{Bmatrix} = \begin{bmatrix} A_{11} & A_{12} & 0 & B_{11} & B_{12} & 0 \\ A_{12} & A_{22} & 0 & B_{12} & B_{22} & 0 \\ 0 & 0 & A_{66} & 0 & 0 & B_{66} \\ B_{11} & B_{12} & 0 & D_{11} & D_{12} & 0 \\ B_{12} & B_{22} & 0 & D_{12} & D_{22} & 0 \\ 0 & 0 & B_{66} & 0 & 0 & D_{66} \end{bmatrix} \begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ 2\varepsilon_{xy} \\ \kappa_x \\ \kappa_y \\ 2\kappa_{xy} \end{Bmatrix} \quad (4)$$

In the present study, symmetric laminations are adopted. So that, all the components of B_{ij} will be zero.

2.2 Nonlinear Imperfection Analysis

For an imperfect CFRP reinforced thin-walled steel cylinders the change in the total potential energy, consequent upon the application of lateral pressure p may be written as

$$\Pi = \Pi_m + \Pi_b + \Pi_\lambda \quad (5)$$

where Π_m are the membrane strain energies, Π_b are the bending energies and Π_λ are the external pressure.

$$\begin{aligned} \Pi_m &= \frac{1}{2} \int_0^{2\pi R} \int_0^L (n_x \varepsilon_x + n_y \varepsilon_y + 2n_{xy} \varepsilon_{xy}) dx dy \\ \Pi_b &= \frac{1}{2} \int_0^{2\pi R} \int_0^L (m_x \kappa_x + m_y \kappa_y + 2m_{xy} \kappa_{xy}) dx dy \quad (6) \\ \Pi_\lambda &= -p \int_0^{2\pi R} \int_0^L w dx dy \end{aligned}$$

In Eq. 6, (n_x, n_y, n_{xy}) and (m_x, m_y, m_{xy}) are calculated using the constitutive relation for the laminated plate as shown in Eq. 4.

To get the strain-displacement relationship Donnel-Mushtari-Vlasov type is adopted for the deformations from the initial imperfections w^0 as

The linear sum of bi-harmonic function that satisfy the above boundary condition, the displacement functions u , v and w as

$$\begin{aligned}
 \kappa_x &= -\frac{\partial^2 w}{\partial x^2}, \quad \kappa_y = -\frac{\partial^2 w}{\partial y^2}, \quad \kappa_{xy} = -\frac{\partial^2 w}{\partial x \partial y} \\
 \varepsilon_x &= \frac{\partial u}{\partial x} + \frac{\partial w^0}{\partial x} \frac{\partial w}{\partial x} + \frac{1}{2} \left(\frac{\partial w}{\partial x} \right)^2, \\
 \varepsilon_y &= \frac{\partial v}{\partial y} - \frac{w}{R} + \frac{\partial w^0}{\partial y} \frac{\partial w}{\partial y} + \frac{1}{2} \left(\frac{\partial w}{\partial y} \right)^2, \\
 \varepsilon_{xy} &= \frac{1}{2} \left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} + \frac{\partial w^0}{\partial x} \frac{\partial w}{\partial y} + \frac{\partial w^0}{\partial y} \frac{\partial w}{\partial x} + \frac{\partial w}{\partial x} \frac{\partial w}{\partial y} \right)
 \end{aligned} \tag{7}$$

End boundaries are assumed to be supported in such a way as to conform to the classical simple support, corresponding with the conditional expression as

$$w = 0, \frac{\partial^2 w}{\partial x^2} = 0, \frac{\partial u}{\partial x} = 0, v = 0 \text{ at } x = 0, L \tag{8}$$

The linear sum of bi-harmonic function that satisfy the above boundary condition, the displacement functions u , v and w as

$$\begin{aligned}
 u &= \sum_{i=0,b,2b,3b} \sum_{j=1}^{J_i^u} u_{i,j} \cos(iy/R) \cos(j\pi x/L) \\
 v &= \sum_{i=b,2b,3b} \sum_{j=1}^{J_i^v} v_{i,j} \sin(iy/R) \sin(j\pi x/L) \\
 w &= \sum_{i=0,b,2b} \sum_{j=1}^{J_i^w} w_{i,j} \cos(iy/R) \sin(j\pi x/L)
 \end{aligned} \tag{9}$$

where, $u_{i,j}$, $v_{i,j}$ and $w_{i,j}$ are the amplitudes of each harmonic function; i and j are the circumferential full-wave and the longitudinal half-wave number, respectively. The initial geometric imperfection is taken to consist of a harmonic of

$$w^0 = w_{b,f}^0 \cos(by/R) \sin(f\pi x/L) \tag{10}$$

in which b and f represent the circumferential full-wave and longitudinal half-wave number, respectively.

3. RESULTS AND DISCUSSIONS

For the analysis of laterally pressurised reinforced shells, steel and FRP's are laminated with constant steel with wall thickness of $t_s = 4\text{mm}$ as shown in Fig.1 and the adopted geometrical parameters are $L/R = 0.512$ and $R/t_s = 405$. Also, t_f represents the thickness of carbon fibre ranging the thickness of fibre from 0 to t_s . Similarly, Model S indicates for steel with no reinforcement and FSF-1 indicates for steel with reinforcement 1 mm CFRP on each side. While, Young's moduli for steel, fibre and polymer are taken as $E_s = 205\text{GPa}$, $E_F = 235\text{GPa}$, $E_P = 3.5\text{GPa}$, and Poisson's ratios for steel, fibre and polymer are $\nu_s = 0.3$, $\nu_F = 0.3$ and $\nu_P = 0.34$, respectively.

Figs.(2a), (2b) and (2c), are the outcome of nonlinear imperfection analysis, linear buckling analysis and the reduced stiffness (RS) analysis with the horizontal axis as circumferential full wave number i for model S ($t_f = 0\text{mm}$) and FSF-1 ($t_f = 1\text{mm}$) model with angle of fibre orientation 0° and 90° , respectively. The linear buckling loads with varying longitudinal half-wave number j are defined as $P_{cm,j}$. Then the corresponding circumferential full-wave number is obtained as $i_{cm}(j)$. After that, its RS critical load associated with $i_{cm}(j)$ is calculated as $P_{cm,j}^*$. Consequently, from all the calculated $P_{cm,j}^*$, the minimum value can be selected as defining the RS criterion^[8] P_{cm}^* as depicted on figures.

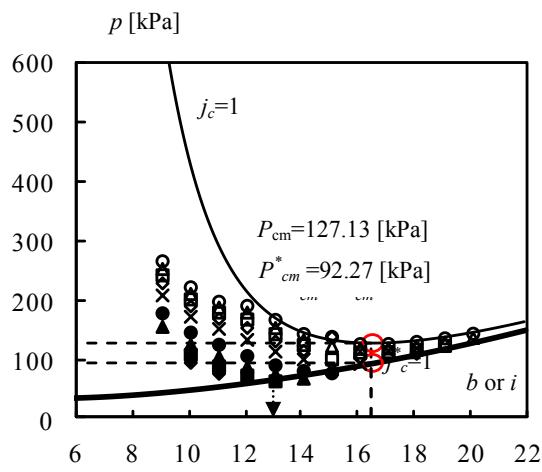
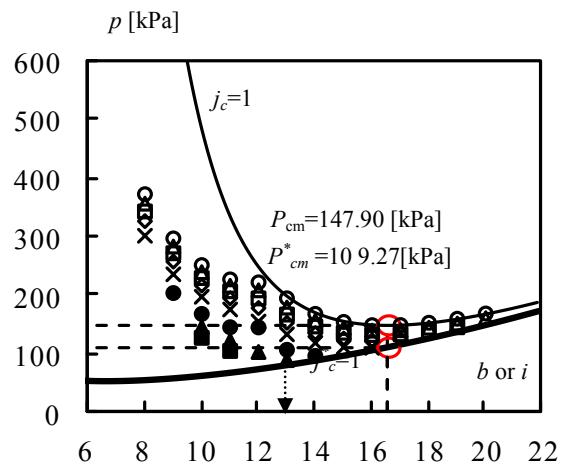
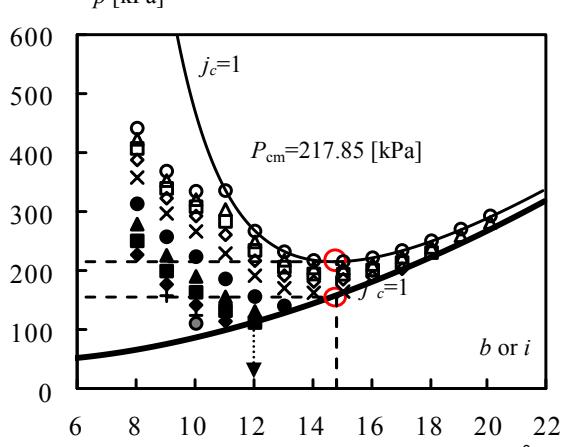


Fig.(2a): for model S

Fig.(2b): for model FSF-1, with $\theta=0^\circ$ Fig.(2c), for model FSF-1 with $\theta=90^\circ$

- | | | |
|------------------------|------------------------|------------------------|
| ○ $w_{b,1}/t_s = 0.00$ | ◇ $w_{b,1}/t_s = 0.10$ | ▲ $w_{b,1}/t_s = 0.60$ |
| △ $w_{b,1}/t_s = 0.02$ | × | ■ $w_{b,1}/t_s = 0.80$ |
| □ $w_{b,1}/t_s = 0.05$ | ● $w_{b,1}/t_s = 0.40$ | ◆ $w_{b,1}/t_s = 1.00$ |
| + $w_{b,1}/t_s = 1.20$ | ■ $w_{b,1}/t_s = 1.80$ | |
| ● $w_{b,1}/t_s = 1.40$ | ◆ $w_{b,1}/t_s = 2.00$ | |
| ▲ $w_{b,1}/t_s = 1.60$ | | |

Fig:(2a), (2b) and (2c); Load Spectra for model S, FSF-1, $\theta=0^\circ$ and FSF-1, $\theta=90^\circ$

But in this paper, predicting the lower bound by RS buckling load and its impact will not be discussed briefly, only the influence of nonlinear numerical experiment of larger imperfections having a form $(b,f) = (13,1)$ with amplitude $(w_{13,1}^0)/t = 0.8$ for model S, $(b,f) = (13,1)$ with amplitude $(w_{13,1}^0)/t = 0.6$ for model FSF-1 having an angle of fibre orientation 0° and $(b,f) = (12,1)$ for model FSF-1 with amplitude $(w_{12,1}^0)/t = 0.8$ having an angle of fibre orientation 90° , where the minimum nonlinear buckling loads exhibits and are observed to produce buckling loads that are lower than P_{cm}^* associated with the mode $(i_{cm}^*, 1)$. What is fascinating about the nonlinear results are that despite the shape of initial imperfection, $(w_{13,1}^0)$, the incremental mode at buckling, at least when imperfection amplitudes are large, is dominated by wave form having considerably shortened circumferential and axial wave lengths. For the case of FSF-1 model and $\theta = 90^\circ$ shown in Fig. 5b, for example, the incremental mode at buckling for the large imperfection $w_{12,1}^0/t = 0.8$, has through a process of modal coupling reached localised shapes closer to that associated with $(i,j) = (12, 1.82)$.

Figs. 3a and 3b are the result of nonlinear numerical experiment for model S, $b=13$ where the minimum nonlinear buckling load occurs. Fig. 3a is the load versus displacement curves with incremental displacement at the buckling mode in the case of $b=13$ and Figs. 3b are the incremental circumferential at $x=L/2$ and axial $y=0$ wave forms at the buckling points. Similarly, Fig. 4a is the load versus displacement curves with incremental displacement at the buckling mode in the case of circumferential full wave number $b=13$, for model FSF-1 with an angle of fibre orientation $\theta=0^\circ$ and Figs. 4b are the incremental circumferential at $x=L/2$ and axial $y=0$ wave forms at the buckling points. Figs. 5a and 5b have the same explanations for the same model as Figs. 4a and 4b but with an angle of fibre orientation $\theta=90^\circ$ and $b=12$. While comparing the Figs. 3a, 4a, and 5a, it can be understood that the buckling load carrying capacity is higher for reinforced condition (Figs. 4a and 5a) and attains maximum strength in the case of $\theta=90^\circ$ for all the amplitudes and this capacity will be the highest as we decrease the amplitude.

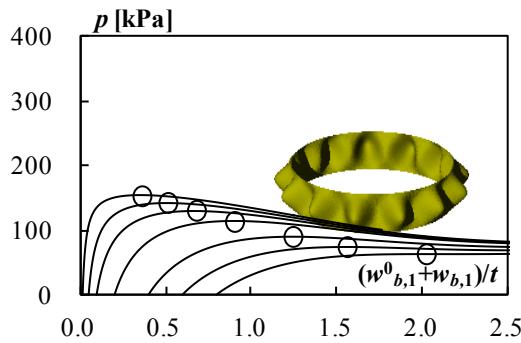


Fig.3a: Load versus displacement curves for model S

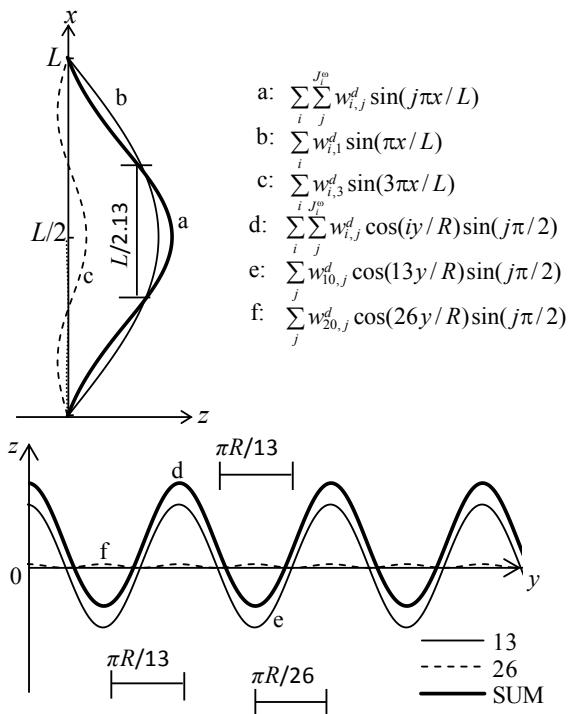


Fig.3b: Incremental wave forms at buckling points for model S

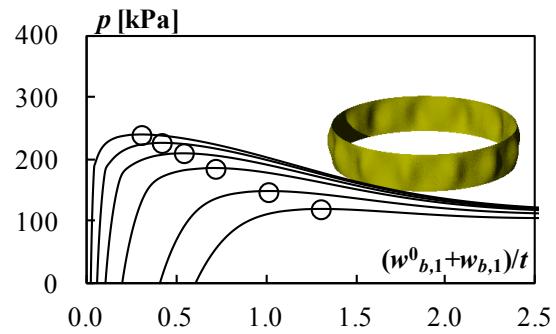


Fig.4a: Load versus displacement curves for model FSF-1, $\theta = 0^\circ$

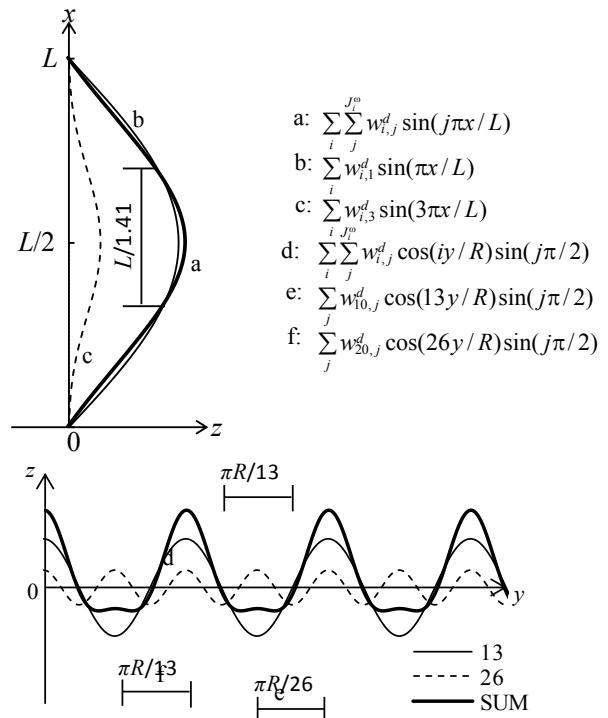


Fig.4b: Incremental wave forms at buckling points for model FSF-1 with $\theta=0^\circ$

Similarly, the outward incremental displacement at the buckling points is sharp during nonreinforced condition (Model S) and if we look for the reinforced condition (FSF-1 model) in both cases of $\theta=0^\circ$ and $\theta=90^\circ$, it is determined that the sharpness of outward incremental displacement goes on decreasing and attains the least value during angle of fibre orientation at $\theta=90^\circ$ exhibiting the considerable dependence upon the angle of fibre orientation, on the other hand, the buckling loads for large imperfections also remarkably shows load dependence upon the angle of fibre orientation within it. For this mechanism, it can be stated that CFRP reinforcements act as the stiffeners from the both sides reducing the axial and circumferential outward incremental displacement and thus load carrying capacity of the proposed model is increased. Again, Figs. 3b, 4b and 5b shows the typical significant changes in mode at buckling as compared with the form of initial imperfection in the case of axial ($y=0$) and circumferential ($x=L/2$). These all figures shows the process of modal coupling which reached the localized shapes closer to that associated with the $(i,j)=(13, 2.13)$ for model S, $(13, 1.41)$ for model FSF-1 with $\theta=0^\circ$ and $(12, 1.82)$ for model FSF- with $\theta=90^\circ$, respectively.

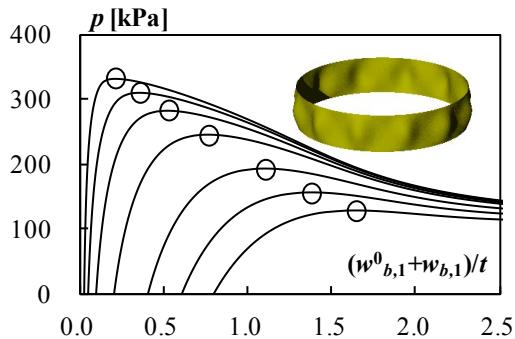


Fig.5a: Load versus displacement curves for model FSF-1, $\theta = 90^\circ$

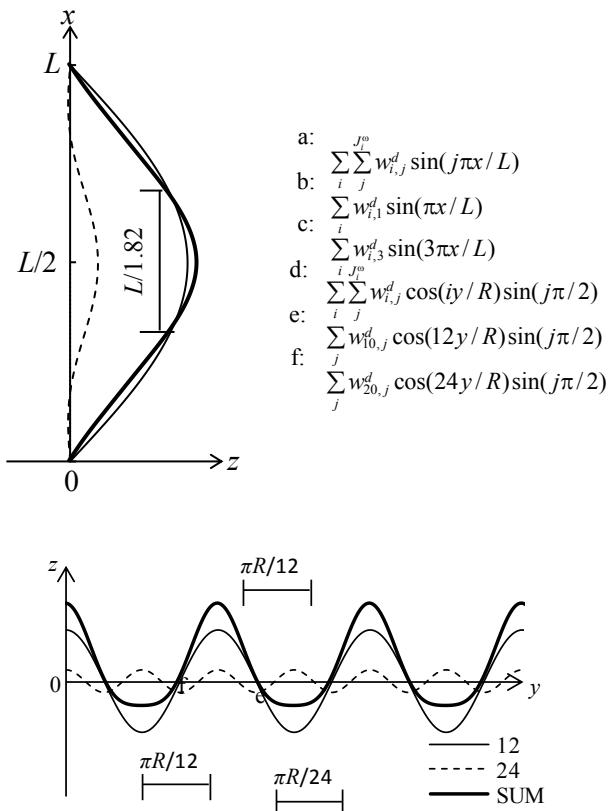


Fig.5b: Incremental wave forms at buckling points for model FSF-1, $\theta = 90^\circ$

4. CONCLUSIONS

In this paper, nonlinear numerical experiments have been carried out for the CFRP laminated reinforced thin-walled steel cylinders under lateral pressure and found that with the CFRP reinforcement, load carrying capacity of the thin-walled steel cylinders will be increased tremendously but depends upon the angle of fibre orientation. For the symmetrical case of laterally pressurized CFRP reinforced thin-walled steel cylinders, it is best to adjust the angle of fibre orientation at $\theta=90^\circ$ to obtain the maximum load carrying capacity. Also, from the analysis it is understood that the influence imperfection is very high for pressurised cylindrical shells.

REFERENCES

- Moy S. (2001), ICE Design and Practice Guides, *FRP composites life extension and strengthening of metallic structures*. London (UK), Thomas Telford Publishing.
- El Damatty, A.A., Abushagur, M., and Youssef, M.A. (2003), "Experimental and analytical investigation of steel beams rehabilitated using GFRP sheets", *Steel & Composite Structures*, Vol.3, issue 6, 421–438.
- Yamada, S. and Croll, J.G.A. (1999), "Contributions to understanding the behavior of axially compressed cylinders", *J. Applied Mechanics*, ASME, Vol. 66, 299-309.
- Matsumoto K., Yamada S., Wang H.T. and Croll J.G.A: (2007), "Buckling and reduced stiffness criteria for FRP cylindrical shells under compression", *Proceedings of Asia-Pacific Conference on FRP in Structures*, APFIS 2007, Vol.1, 465-470.
- K.K., Bhetwal, , Yamada, S. and Yanagida, M. (2009), "Buckling and reduced stiffness analyses of laminated carbon fiber reinforced polymer cylindrical shells", *Proc. of the 7th Japan-Korea Joint Symp. on Composite Materials*, JACM, Kanazawa, p.241-242.
- K.K., Bhetwal and Yamada, S. "Effects of CFRP reinforcements on the buckling behaviour of thin-walled steel cylinders under compression", *International Journal of Structural Stability and Dynamics*, Vol.12, No.1 (2012), 131-151.
- Jones, R.M. (1999), *Mechanics of Composite Materials*, Taylor & Francis.
- Batista, R.C. and Croll, J.G.A. (1979) "A design approach for axially compressed unstiffened cylinders", *Stability Problems in Engineering Structures and Components*, Applied Science, London.

WATER RESOURCES MODELING AND OPTIMIZATION FOR PLANNING AND MANAGEMENT OF A WATERSHED: A CASE STUDY OF BABAI RIVER BASIN OF NEPAL

Manoj SHRESTHA

Department of Water Resource, Tribhuvan University, Kathmandu, Nepal,

Email: manoj-shrestha@hotmail.com

ABSTRACT: The present study is primarily focused on development of water allocation model/DSS model optimized for defined objectives in different Scenarios in the Babai River Basin, Nepal. The study comprise of developing a HEC-HMS model to simulate runoff at defined nodes of the basin using rainfall data. Then the optimization model developed using GAMS simulates different scenarios with or without future projects planned to be implemented in the Babai river basin (Sarada-Babai storage HEP and Bheri-Babai diversion scheme) to study the demand and supply situations of different demand nodes of the basin. The developed model also generates optimum diverts for each node for minimizing demand deficit and another for maximizing total benefit. In addition to this, the model also generates the Optimum Cropping pattern based on Supply and demand which on implementation yields maximum benefit.

Keywords: DSS, HEC-HMS, GAMS, HEP, Optimization model

1. INTRODUCTION

Nepal stands amongst one of the richest country in water resources. Water being one of the natural resources supporting the economy of Nepal, it needs to be carefully managed to make it effective and sustainable.

In a river basin water resources could be scarce for a demand site and the same water resources could be plenty for another demand site. This is because the river basin has temporal and spatial variation of supply and demand. 80% of flow occurs in the four months of June to September in Nepal. Also there are multiple users of water resources within a basin having different priorities. There might be conflict between upstream and downstream users about water rights and conflict in water use in different priorities such as hydropower, irrigation, water supply and industrial use of water.

Thus planning and management of water resources in a river basin is needed. To do so, we need to understand the hydrology of the river basin and river basin optimization model as Decision support System (DSS) so that the water resources are utilized and allocated in an optimal way. So, optimization of basin as a whole helps to utilize the natural resources of the basin in an optimal ways avoiding any future shortages, avoids the conflicts between the multiple stakeholders using the water from same basin, also determines the priorities for development and investment, avoids the implementation of irreversible plans that might limit the future freedom of choice on vital area and minimizes the cost of water resources development and the most important of all the criteria of Integrated Water Resources Management (IWRM) will be fulfilled.

Numbers of Simulations models have been developed and used water resources planning and management. Maass et al. (1962) used simulation to evaluate the benefits for basin-wide water resources planning. Hufschmidt and Fiering (1966) used simulation to study the planning problem of the Rhine river system under multiple reservoir and multiple-objective conditions. The U.S Corps of Engineers developed HEC-5 for flood control and water conservation. Delf Hydraulics (1991) developed a simulation model, RIBSIM, to analyze the long term supply-demand planning in Taiwan. Chow (1995) formulated the simulation model into network model for water resources management for the Tsenwen and Kaoping watersheds in southern Taiwan. Many researchers used linear programming to solve water resources planning and management problems. Also, MIKE BASIN simulation model was developed by Danish Hydraulic Institute (DHI).

Optimization models provide a means of reducing the number of alternatives which need to be simulated in detail, i.e., screening them. These models search the space of possible design variable values and identify an optimal design and/or operating policy for a given system design objective and set of constraints (McKinney et al., 1999). The optimization models available already used in a river basin study cannot incorporate various types of objective and constraints in another river basin system. So, a suitable optimization model is needed to be developed which meets the required objective functions and all the constraints.

This paper an attempt to purpose a water allocation model/DSS using GAMS(General Algebraic Modeling

System) for optimization of the Babai River Basin required for optimal distribution of scarce water resource for the maximum benefit and improving demand satisfaction of irrigation, water supply and energy demand in the present scenario .Also it is imperative to study the future scenario of supply and demand after inclusion of the anticipated projects in the basins which is comfortably assessed in the purposed optimization model.

2. STUDY AREA

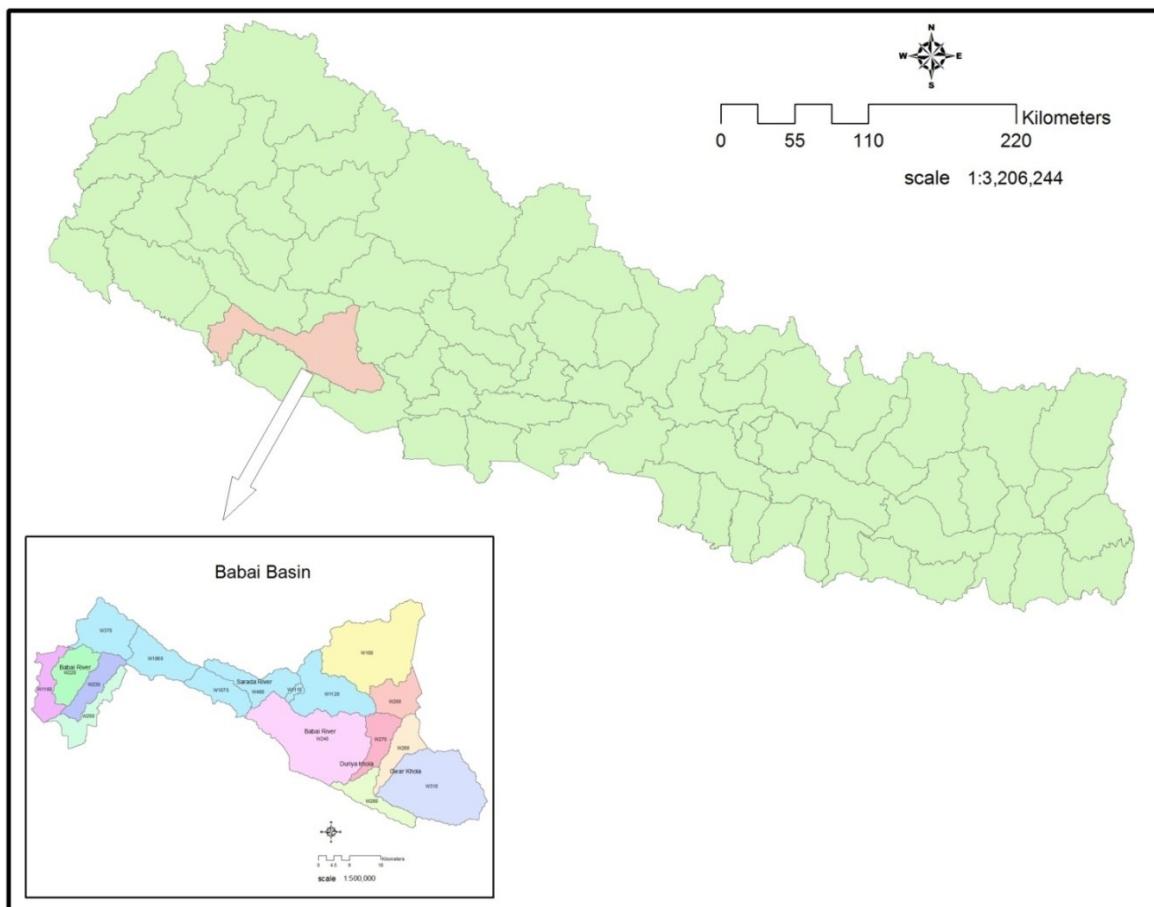


Fig.1 Study Area of Babai Basin

Babai river basin is the medium river basin with a catchment of about 3422 sq.km geographical area and 190km length .Babai originates from siwalik range at Churia near Dharepani in Dang districts and flows towards west draining Dang valley and joins Gargha (Karnali) in India .Its major tributaries are Sarada river, sewar khola, and Gwar khola.(Yadav,2002)

Babai River Basin is one of the dry river basins in Nepal where average supply barely meets the potential demand of the basin .Out of the total potential irrigation area within and its vicinity of 125000 ha, 52000 ha of land is presently irrigated .Similar condition arises in case of the water supply as well and it is obvious that growing populations of the Babai Basin seeks more water supply demand. Till now there is no major water resources infrastructure development in Babai basin except Babai irrigation Project which has potential to irrigate 40000 ha. of Bardia District. There are future projects such as Bheri Diversion Scheme and Sarada Babai Multipurpose Projects. 40m³/s inter basin transfer of water from Bheri River to Babai River is expected to fulfill extensive irrigation demand with an average annual energy generation of 408/Gwh/yr. Further, implementation of Sarada Babai Storage Project improves the satisfaction of the irrigation demand and generates energy of 169Gwh/yr. (Tahal et al., 1978)

3. METHODOLOGY

DEM of the study area is prepared by merging the different contour raw tile data (20m resolution) acquired from the Department of Survey (DOS) with ArcGIS 9.3.Using HEC-GeoHMS. tool of the Arc GIS 9.3, DEM is processed to get the watersheds delineated and river networks are generated. Also physical characteristics of the

basin and river are also extracted to be used in the HEC-HMS (a rainfall runoff model) later on.

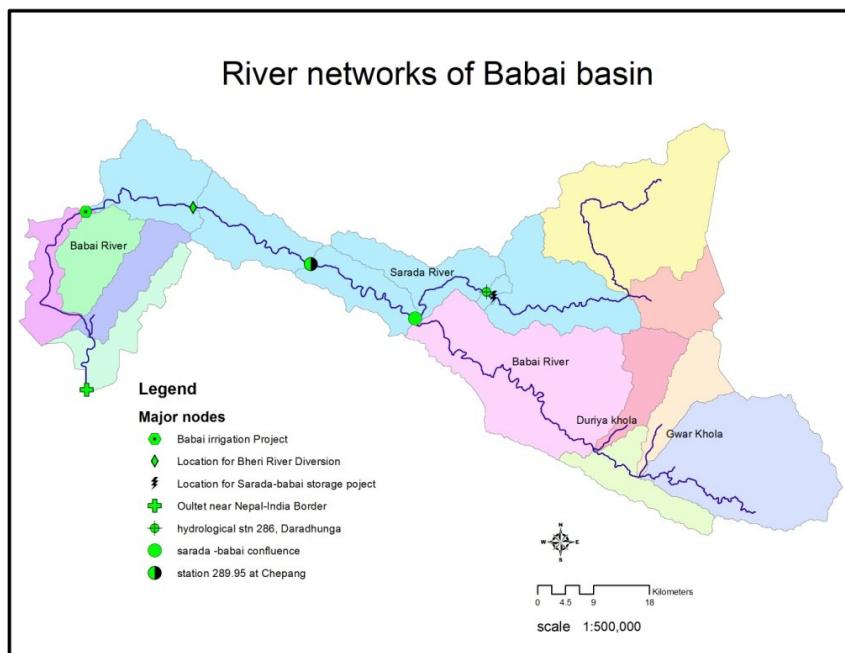


Fig. 2 River networks and major nodes in the Babai River Basin

Daily precipitation data of the meteorological stations of the Babai Basin is acquired from DHM. Thiessen Polygons are prepared and weight age of the meteorological stations in the delineated Sub basins are calculated which is one of the input data in HEC-HMS model. After the completion of all the inputs in the HEC-HMS model the model is run for selected period of the time. Now the output results are compared with the observed discharge at the gauging stations. If the output results are not found matched with the observed data within the specified limit, the parameters of the watersheds are calibrated again to bring the watershed parameters to optimum level. The calibration process terminates once the deviations of the output results compared to the observed data falls within the specified limits. After the calibration of the parameters, it is validated for the selected year. Once the validation process is completed the model is used to generate the data at the defined nodes of the basin which acts as supply data in the GAMS Optimization Model.

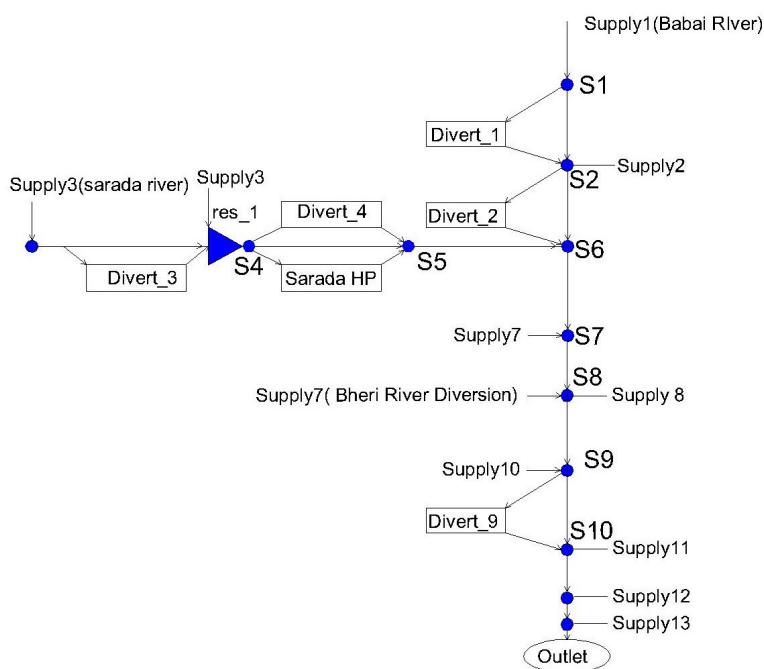


Fig.3 River Network diagram of Babai Basin for GAMS Optimization

River network diagram of the Babai basin is prepared based on the major water demand areas, existing and purposed projects (irrigation and hydropower). The small rivers in the catchment joining the main river i.e. Babai river are treated as supply in the network diagram. The outlet of the network diagram is taken in the Nepal-India border.

After the generations of the discharge data at all nodes specified in the River network diagram using the HEC-HMS model, GAMS models are developed for the further analysis and Optimization. Other data such as Cropping pattern, Crop yield, Economic value of the crop, Hydropower per unit value, Hydropower demand, hydrological data etc. of the Babai basin are assessed and processed for the further use in the GAMS model. And the model is modified to simulate the various scenarios to get desired results in order to meet defined objective.

Formulations of the GAMS model

Two objective functions are considered for the preparations of two GAMS optimization model in this river basin study:

Objective function 1

$$\text{Minimize} \sum_n \sum_y \sum_t [(Divert(n, y, t) - Demand(n, t)) / Demand(n, t)]^2$$

Equation 1

$$\text{Minimize} \sum_n \sum_y \sum_t [(Divert(n, y, t) - Demand(n, t))]^2$$

Equation2

This objective function will distribute the water in such a way that for higher demand values, water diversion will be higher and at lesser demand values, water diversion will be less but the percentage diversion will be equal unless priority is given to the node. Using this objective function will overlook the less demand values and will try to minimize the deficit where demand values are higher. It means that this objective function will divert the water to demand point which has higher demand values and may not divert to the lesser demand values. An alternative to this objective function is to minimize the percentage demand deficit at all demand nodes.

Objective function 2

Another approach will be to maximize the total benefit derived from various purposes. For this objective function will be as follows.

$$\text{Maximize} \sum_c \sum_n yield(n, c) * Area(c, n) * netpc(c) + \sum_n \sum_y \sum_t E(n, y, t) * netphp(n, t)$$

Equation 3

Where,

yield (n, c)

= yield of crop c at demand node n;

Area(c, n)

= maximum irrigable area for crop c at demand node n;

NETPC(c)

= net price for crop c;

E (n, y, t)

= Energy generated as per diversion at demand node n for t months in y years;

NETPHP (n, t) = net price for hydropower at node demand node n for t months;

The first term in equation 3 is the irrigation benefit which is computed by multiplying the crop area with the crop yield and the price associated with the yield per ton. The second term is the energy benefit which we get by multiplying the energy generated with the price per KWh of the energy

4. RESULTS AND DISCUSSIONS

The study comprise of two parts: One is *hydrological model* to generate the data at each defined node and another is the *Optimization Studies* of the Basin. *HEC-HMS Model Calibration and Validation*

The model is calibrated at the Chepang using observed daily rainfall-runoff data for year 1993-1995. A manual calibration in addition to automated calibration technique is applied to estimate values of model parameters, with care to limit the parameter values within acceptable range.

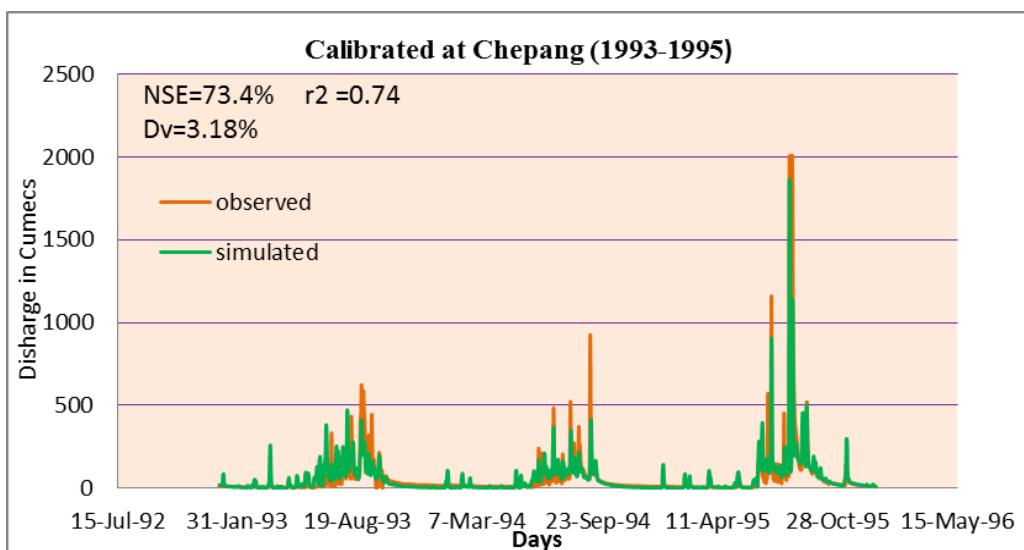


Fig. 4 Observed and Simulated Hydrograph comparison of flow at Chepang for calibration period 1993-1995

The model simulated the discharge at Chepang for year 1993-1995 with Nash efficiency 73.4%, the R²-value 0.74 and the volume deviation -3.18%. For validation of the model, outflow at Chatara is simulated for year 1997 and is compared with corresponding observed flow. The model is well validated with Nash efficiency 71.79%, the R²-value 0.7 and the volume deviation -13.8%

GAMS model are developed for analysis of supply and demand conditions of the different selected nodes of the Basin. Optimum monthly water allocation for irrigation and hydropower use under different scenarios are the major outcomes of the result. Also simulation studies are carried out with the inclusion of Purposed projects like Sarada-Babai Storage Project and Bheri-Diversion projects under different Scenarios. Domestic and Industrial Water Supply are not included in the model since their demand is significantly low compared to the Irrigation and Hydropower demand. They are assumed to be incorporated in the minimum in stream flow of the rivers.

Model 1: Basin optimization model with objective function of minimizing Demand deficit.

Using this objective function will overlook significantly less demand values and will try to minimize the deficit where demand values are higher. It means that this objective function will divert the water to demand point which has higher demand values and may not divert to the lesser demand values. Four different Scenarios are simulated in this model. Water diversion per month for each demand node (irrigation and Hydropower node) is the main outcome of the result for each Scenario. Also storage characteristics of the Sarada reservoir and Flow characteristics of Bheri-Babai Diversion Scheme are studied in this model. Same crop calendar and cropping pattern is assumed and used for demand Calculations for all the nodes of the Basin.

Scenario 1: Optimization with existing water balance Condition minimizing demand deficit

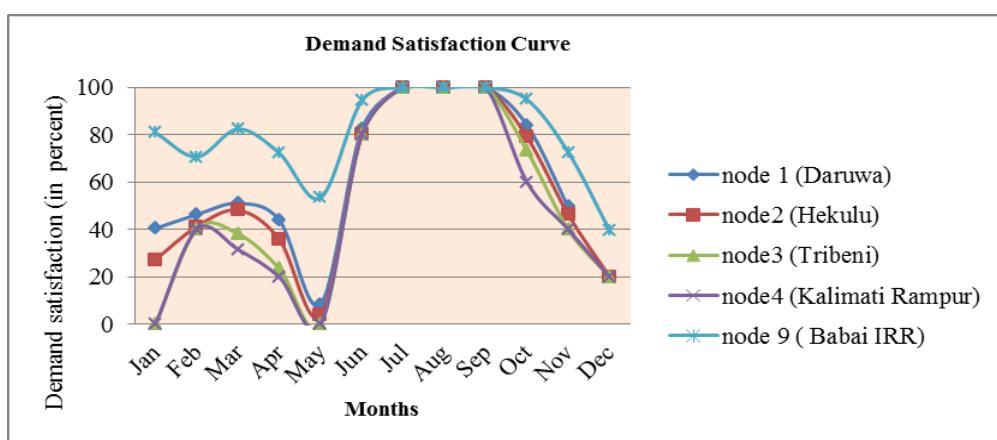


Fig. 5 Demand Satisfaction Curve

With the inclusion of potential additional demand of 38000 ha additional demand on the Babai Irrigation project, demand Satisfaction of the Babai irrigation Project decreases from 80% of the first Scenario to 52% on the month of May as shown in Fiugure-5. Demand of the June to October are satisfied in this case also .The demand satisfaction of all other nodes except Babai basin remained same with little demand deficit in the month of May.

Scenario 2: Optimization of Babai basin minimizing demand deficit with inclusion of Bheri Diversion.

The main objective behind the implementation of the Bheri-Babai diversion project is to strengthen the Babai Irrigation Project. As seen from the Fig.6, inclusion of Bheri Diversion Scheme has comfortably satisfied the demand of Babai irrigation Project with additional net commanding area of 38000ha (JICA, 1993) to be irrigated using the inter-basin transfer diversion of 40m³/s from Bheri river to Babai river basin. Maximum plant discharge of 40m³/s is diverted from Bheri river to generate 48MW power.

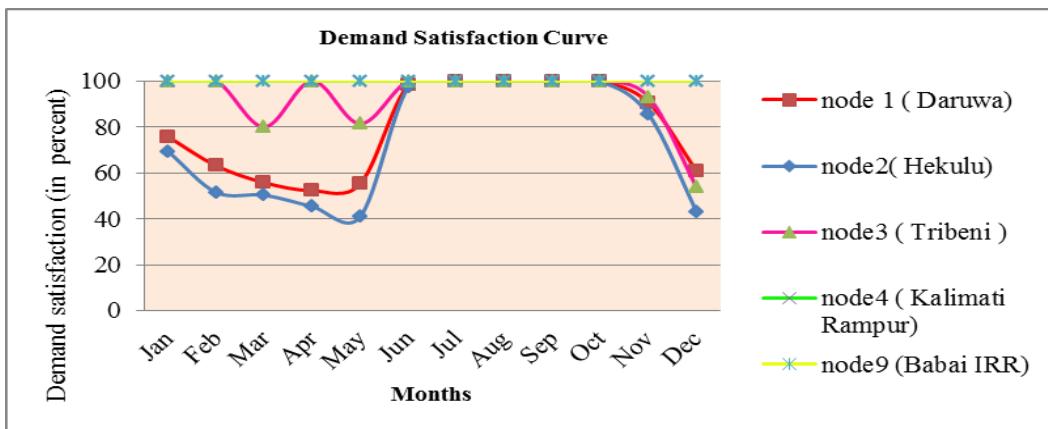


Fig. 6 Demand Satisfaction Curve

Though the irrigation demand at the Babai irrigation project is met by the Bheri-Babai Diversion .Demand Deficit in the upper basins still exists in appreciable amount. Slight improvement in the demand satisfaction of upper node can be seen as well above the diversion point, it's because the model optimizes the downstream demand node not to draw too much water from upstream nodes.

Scenario 3: Optimization of the Basin minimizing demand deficit with Sarada Storage Project. (Alternative options to Bheri -Babai Diversion)

The future irrigation water requirement within and vicinity of the Babai basin exceeds the available flow in the basin as in the base case scenario (without any interventions) and especially in the lower part of the basin, implementation of a flow reservoir can help augment flow to the demand. In the case of Babai basin, Sarada-Babai storage project can substantially increase the dry season flow which can be seen in Fig. 7. As a result in increase of dry season flow the demand deficit in May which is the month of highest demand is completely satisfied for Babai Irrigation Project. Implementation of Sarada-Babai Storage HP project when optimized for minimizing demand deficit comfortably satisfies all the demand in the Babai irrigation project with the production of mean monthly energy of 18.13 Gwh.

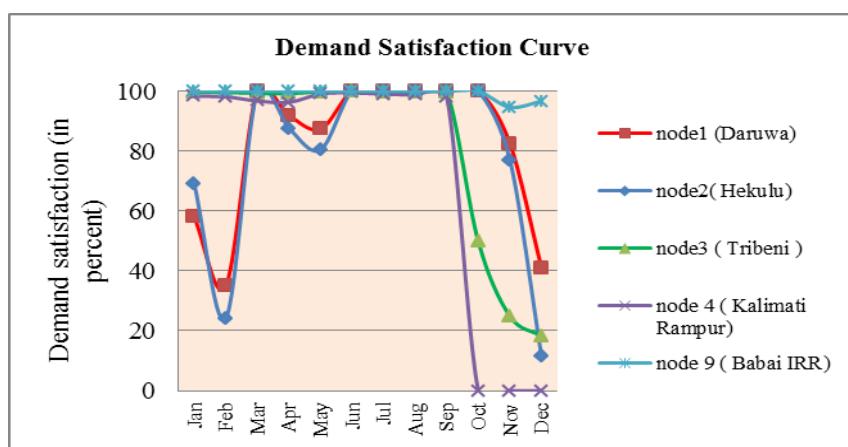


Fig.7 Demand Satisfaction Curve

Reservoir regulations:

Optimized Reservoir Operation Curve for the Sarada reservoir is shown in Fig.8. The decreased Reservoir Level in May implies more release of water during that period .Comparison of hydro release, irrigation release and downstream release has been made in Fig.9. Irrigation release to demand node4 is insignificant compared to release in hydropower. It's because the water demand for hydropower is significantly higher compared to irrigation divert. It's a non-injected priority to the higher demands by the program itself while minimizing demand deficit. The average demand of for node is only 0.77 while the average demand for water demand for the production of energy is 61.26 Gwh.

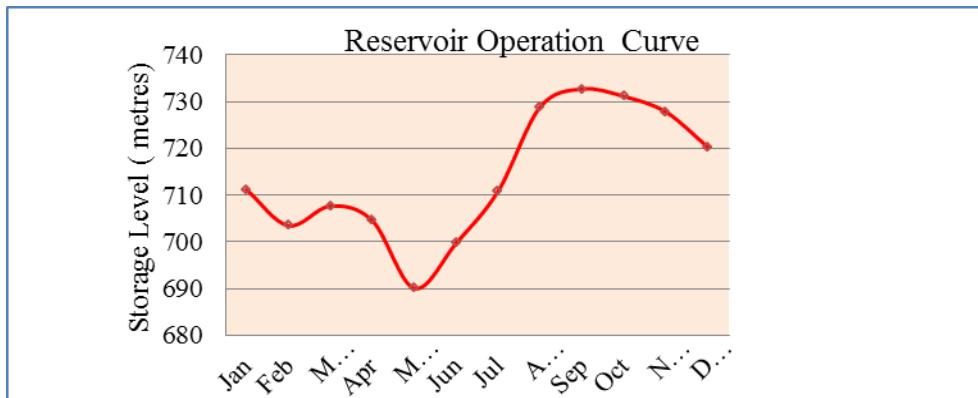


Fig. 8 Reservoir Operation Curve

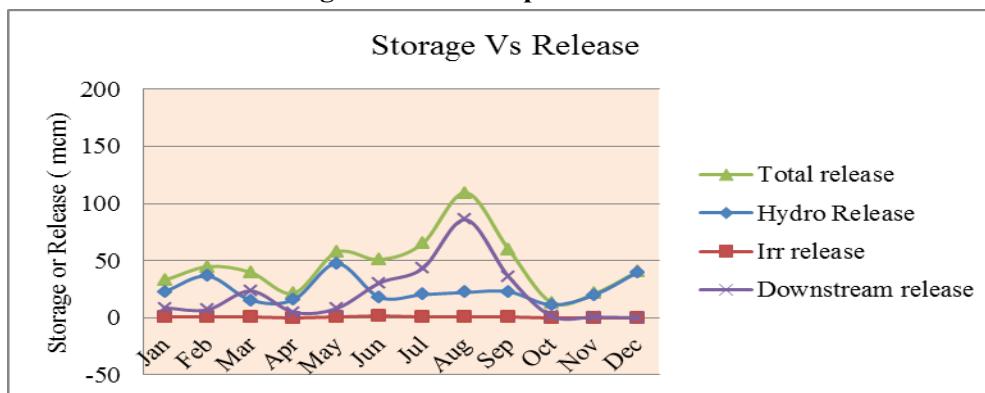


Fig. 9 Comparison of releases (simulated for 1993)

Model 2: Basin Optimization model with the objective function of maximizing Total Benefit.

Model 2 maximize the Total benefit (objective value) which is the sum of benefits from Hydropower and Irrigation .It optimizes the cropping area and gives cropping pattern at different defined nodes including optimum energy to be produced at hydropower nodes in the Babai Basin which will give maximum total benefit based on the availability of water, net crop water requirement, crop yield price of each crop and price of energy generated.

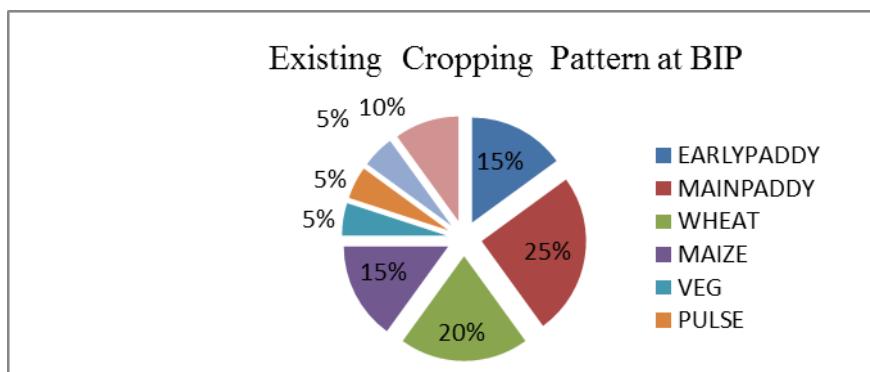


Fig. 10 Existing Cropping Pattern at Babai irrigation Project

There are two scenarios discussed in this model. Optimum water diversion and Optimum cropping pattern at each nodes has been assessed for each scenario. Also the optimum hydropower production for the maximum benefit has been assessed at hydropower nodes. The existing cropping pattern is shown in Fig.10.

Scenario 1: Optimization with inclusion of Bheri-Babai Diversion Scheme maximizing total benefit.

To fulfill the objective of maximizing total benefit ,the optimization model suggest there will be still demand deficit in January ,May and December to irrigate with the optimized cropping pattern even with the implementation of the Bheri –Diversion Scheme although year around full satisfaction of the demand can be achieved to irrigate in the existing pattern as discussed in the Scenario 2 of model 1. It's because of the significant increment in cropping intensity .The inclusion of Bheri Diversion scheme has remarkably improved the demand satisfaction of the Babai Irrigation Project(node 9) and Kalimati Rampur(node 4). While the demands for other upstream nodes are still unmet.

Optimized Cropping pattern is shown in Fig.12 which suggest for the cultivation of early paddy and Potatoes for the maximum benefit .Optimized divert to meet the above objective is shown in Table-1

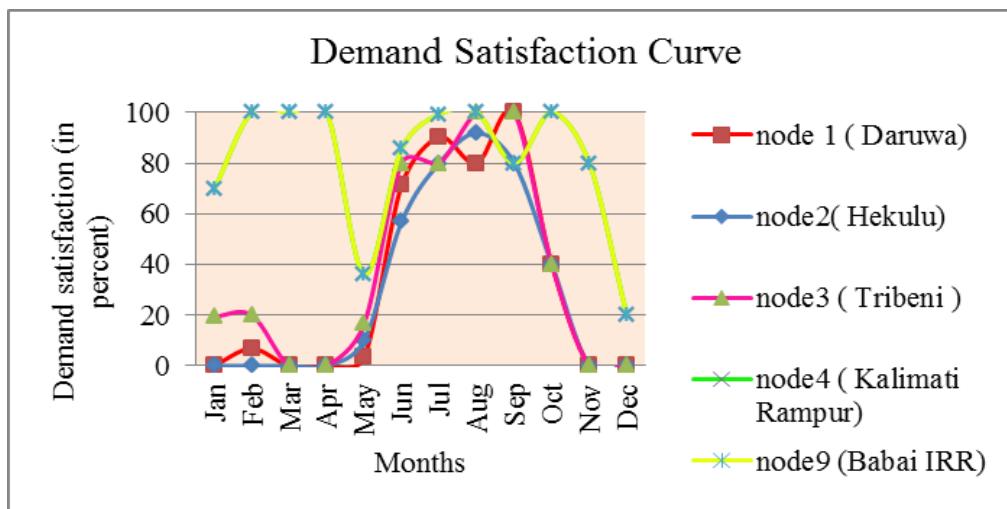


Fig. 11 Demand Satisfaction Curve

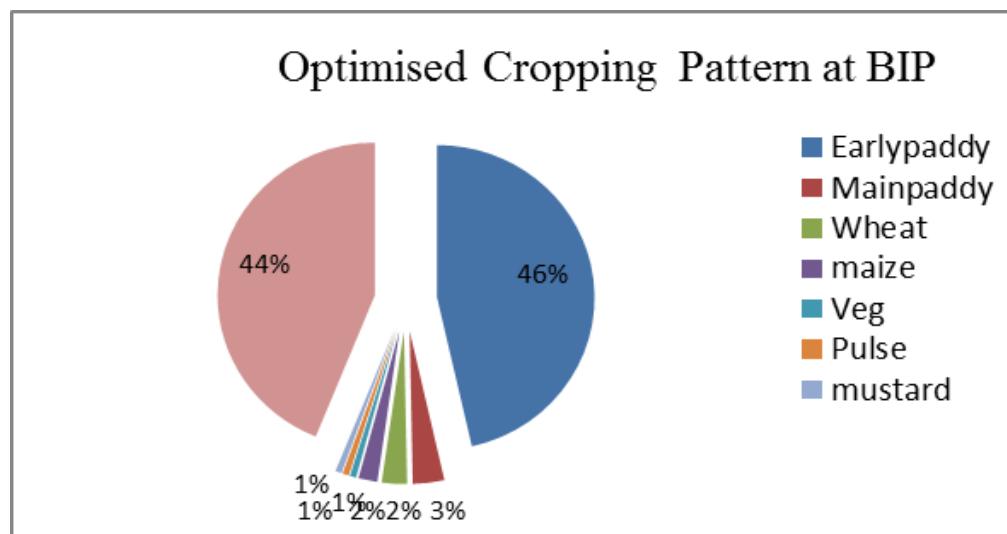


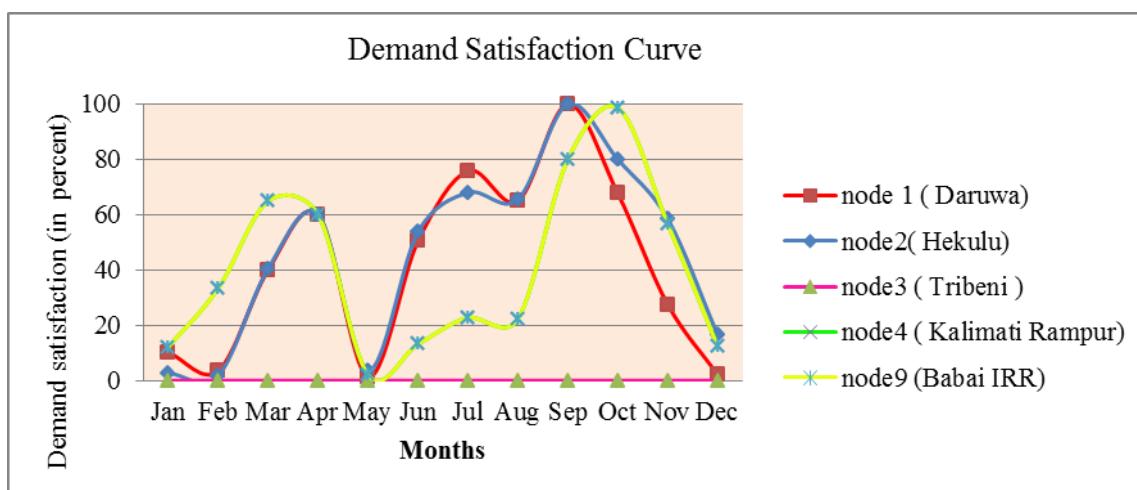
Fig. 12 Optimized Cropping Pattern at Babai Irrigation Project

Table - 1: Scenario 3: Optimum divert at each node (monthly mcm)

	node 1		node2		node3		node4		node9	
month	demand	divert								
Jan	50.70	0.00	38.64	0.00	11.91	2.31	2.59	0.52	216.26	150.52
Feb	24.39	1.65	18.59	0.00	5.73	1.15	1.25	0.25	100.26	100.26
Mar	1.53	0.00	1.17	0.00	0.36	0.00	0.08	0.00	2.09	2.09
Apr	1.15	0.00	0.88	0.00	0.27	0.00	0.06	0.00	1.57	1.57
May	95.93	3.13	73.11	7.30	22.54	3.75	4.90	1.14	397.44	143.61
Jun	76.46	54.61	58.26	33.14	17.97	14.38	3.91	1.56	302.33	259.07
Jul	73.81	66.61	56.25	45.00	17.34	13.87	3.77	3.02	303.07	300.86
Aug	75.20	60.16	57.31	52.65	17.67	17.67	3.84	3.84	312.83	312.83
Sep	6.93	6.93	5.28	4.22	1.63	1.63	0.35	0.14	22.80	18.24
Oct	2.52	1.01	1.92	0.77	0.59	0.24	0.13	0.05	3.43	3.43
Nov	3.34	0.00	2.54	0.00	0.78	0.00	0.17	0.00	9.67	7.74
Dec	41.34	0.00	31.51	0.00	9.72	0.00	2.11	0.00	175.47	35.09

Scenario 2: Optimization with inclusion of Sarada-Babai Storage Project maximizing total benefit.

Optimization with the objective of maximizing the total benefit with the inclusion of the Storage Project in the Babai Basin resulted further increment of the demand deficit with slight improvement in the dry season releases in the downstream node (Babai Irrigation project). All the released water from the reservoir is used for energy production leaving minimum stream flow for irrigation and downstream flow. Since more benefit is achieved by the use of water in energy production than in irrigation section, model uses all the reservoir release to the hydropower generation. Water used for the energy generation can be reused again for downstream irrigation since the return flow coefficient of 1 is used for hydropower in the model while the return flow coefficient used for the irrigation is only 0.15. Demand Satisfaction percentage of each node is shown in Fig.13.

**Fig. 13 Scenario 2: Demand Satisfaction Curve**

Optimized cropping pattern of Babai Irrigation Project generated by the model is shown in Fig.14. Early paddy and potatoes are to be cultivated for more than 97 percentage of the total cropping area for the maximum benefit. Mean monthly energy of 9.66 Gwh is produced by the Sarada-Babai Storage Project in this scenario.

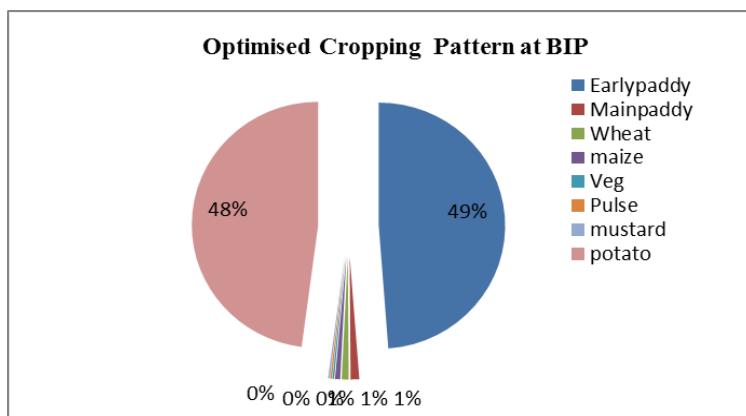


Fig. 14 Optimum Cropping pattern at Babai Irrigation Project

Reservoir Regulations:

Optimized reservoir operation of the Sarada Reservoir is shown in Fig.15. The lowest reservoir level falls on month of April because the stored water of the reservoir is used for the generation of the hydropower generation in January, February, March, and April which has higher energy prices After June the reservoir level kept increasing with the increasing stream flow upstream of the reservoir till the reservoir becomes full at August.

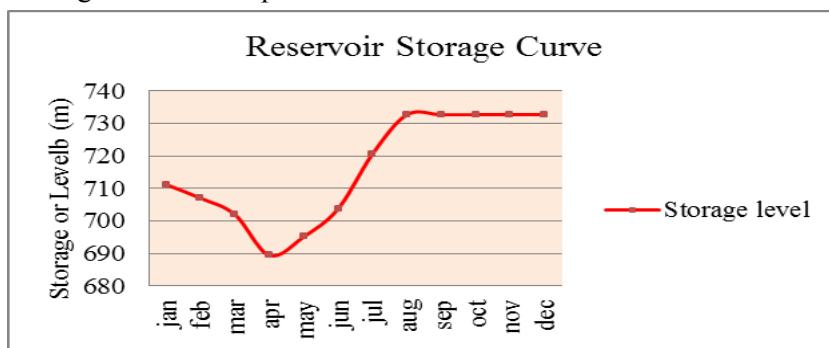


Fig. 15 Reservoir operation curve Sarada-Babai Storage Project

Comparison of releases is shown in Fig.16. All the reservoir releases are programmed to use for the hydro-power release for dry months: January, February, March and April which has higher energy prices so as to maximize the total profit. Thus appreciable release can be observed for that period but it ceases to zero for May June and July. Its because it tends to use all the water stored in the reservoir for next dry season i.e. January, February, March and April. But due to the limitation of reservoir storage, releases have to be made after the reservoir is full in July. As a result, for maximum benefit model prefer hydropower release to irrigation release for August, September and October.

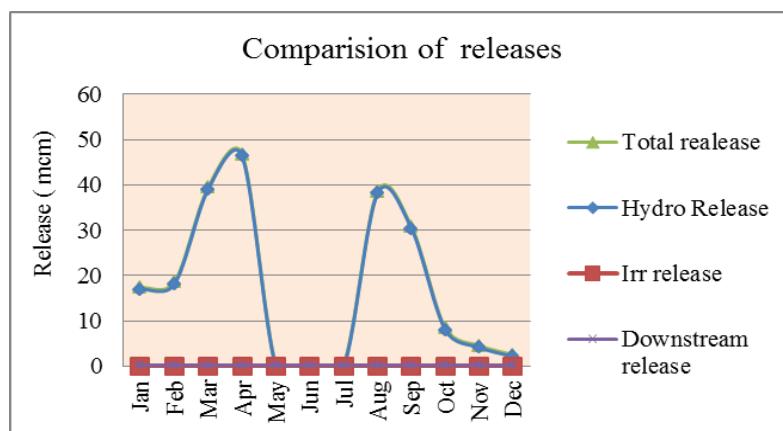


Fig. 16 Comparison of different releases

5. CONCLUSIONS

- Present irrigation demand in the Babai basin is not completely satisfied .Upper Babai basin and Sarada sub basin have comparatively higher demand deficit of around 50% while the lower Babai have lower demand deficit of around 20% in dry season in the existing cropping pattern. The potential irrigation area of 38000 ha if added to the existing Babai irrigation project its demand deficit increases up to 48%.
- Average cropping area in the existing cropping pattern is 20208 ha while average cropping area in the optimized cropping pattern maximizing total benefit is 43863 ha .For maximizing benefit Early paddy should be cultivated in wet season and potatoes in dry season. Maximum benefit can be achieved when 44% of potatoes and 46% of Early paddy are cultivated in the optimized cropping area.
- The implementation of the Bheri-Babai diversion Project completely satisfies all potential demand at the BIP in the existing Cropping pattern while in case of the Optimized cropping pattern for the maximum benefit, demand deficit of 60%, 30% and 80% is still observed in May, January and December.
- Implementation of Sarada-Babai Storage HP project when optimized for minimizing demand deficit comfortably satisfies all the demand in the Babai irrigation project (20208 ha) with the production of mean monthly energy of 18.13 Gwh . On the contrary when optimized for the maximum benefit 13.42 Gwh of mean monthly energy is generated irrigating monthly average cropping area of 43863 ha in Babai irrigation project with appreciable demand deficit in the dry season.

REFERENCES

1. Calif, D., 1979. *HEC-5: Simulation of Flood Control and Conservation System Programming Manual*, Hydrologic Engineering Centre, U.S. Army Corps of Engineers.
2. Chow, N.M., 1995. A Study on Optimal Management of Water Resources in Kaoping area, Taiwan (I). *Project Completion Report to National Science Council, Taipei, Taiwan, R.O.C. (in Chinese)*.
3. Delf Hydraulics, 1991. River Basin Simulation, Project Completion Report to Water Resources Planning Commission, Taipei, Taiwan, R.O.C.
4. Hufschmidt, M.M. & Fiering, M.B., 1966. Simulation Techniques for Design of Water Resource System. *Harvard University Press, Cambridge*.
5. Loucks, D., Haith, D., & Stedinger, J., 2005. *Water Resources System Planning and Analysis*,
6. Maass, A. et al., 1962. Design of Water Resources Systems. *Harvard University Press, Cambridge*.
7. McKinney, D.C. & Savitsky, A.G., 2006. Basic Optimization Models For Water and Energy Management. *University of Texas at Austin, U.S.A.*
8. Suwal, P.R., 2010. *Modelling Water Resources Planning and Management in Babai River Basin Nepal*.
9. Tahal Consulting Engineers, 1978. *Babai Irrigation Project Feasibility Study*,
10. Tahal Consulting Engineers et al., 2002. *Babai and West Rapti Basin*,
11. Water and Energy Commission Secretariat, 2002. *Executive Summary Water Resources Strategy Nepal*, Singha Durbar, Kathmandu, Nepal.
12. Yadav, S.K., 2002. *Hydrological Analysis For Bheri-Babai Hydropower Project Nepal*.

SEISMIC RESPONSE ANALYSIS OF UNREINFORCED BRICK MASONRY STRUCTURE SYSTEM

Rishi Ram PARAJULI

Graduate Student, Dept. of Urban Management, Graduate School of Eng., Kyoto University
Kyoto, Japan, Email: parajuli.ram.27z@st.kyoto-u.ac.jp

ABSTRACT: Historical monuments that had been built in ancient time are mainly constructed of unreinforced brick or stone masonry in mud mortar with timber frames. Strengthening of such monuments is very important which require the analysis of structure. We analyze unreinforced brick masonry structure with a band of concrete in between soil and brick foundation, for three different cases. Changes in displacements and acceleration at top corners are compared. Modeling and numerical analysis of the structural system is based on the finite element method, considering 3D solid elements.

Keywords: Historical monument, seismic response, unreinforced brick wall, soil structure interaction

1. INTRODUCTION

Structures that were built many years ago and have some special importance to the people regarding to the history, religion or others are historical monuments. Safety of these monuments is very important for the preservation of cultural and religious aspects of community and nation. Most of them have crossed the age of design life. Actually, they were built many years ago that no any design methodologies were introduced at that time so only up on the experience of workers and known thumb rules were base of design and construction. Such building faced many natural disasters with collapse, partly damage or no visually damage. Some of the buildings which are not visually damage but may under the fast deteriorating process after disasters. With this background, some studies to investigate the material properties and seismic behavior of the historic masonry buildings are done (H. R. Parajuli, 2010, Furukawa, 2010), but studies investigating the effective reinforcement measures are still few.

Ground motion during the earthquake will introduce displacement, stresses, strains in structure; these values are regarded as response of structure. Accuracy of response of structure is depends on the site condition, source of earthquake, analysis method and assumptions made. Analysis with consideration of soil foundation structure interaction comes near to the real response in many cases. Hard rock base will be as like fixed base due to high stiffness of rock. When the structure supported on soft soil then foundation will not be able to confirm as like free field motion so base of the structure will deviate from free field motion this is known as kinematic interaction and other inertial interaction; which is dynamic response of structure itself induce displacement on soil. This process, response of soil influence on structural motion and vice versa is known as soil structure interaction.

There are many pagoda types, unreinforced brick masonry monuments in Nepal. Especially in capital city Kathmandu we can see such structures. Country sides also have many such buildings they are square in plan having one, two or three stories high. They have masonry foundation and wall, with timber beams and also in outside some of them have timber column to support the roof. Main structure for bearing of load is square shaped, generally brick masonry structure with door in one side and windows in others. Most of them built many years ago are waiting for preservation. Photo 1 is the famous Manakamana temple at Gorkha, Nepal, which is tilting continuously after 1934 earthquake.

Analysis of such structure is most important before planning of preservation work so here we proposed some techniques for improvement of seismic performance. Instead of analysis for only super structure here we are going to analyze the model with soil and concrete. So in the ground level wall is not fixed and it has some displacements during ground excitation. With variation of concrete band, what type of effect that causes during the earthquake is going to analyze considering 3-D solid elements by Finite Element Method (FEM).



Photo 1: Manakamana Temple

<http://www.flickr.com/photos/62249398@N08/5845490025/sizes/l/>

2. NUMERICAL MODELLING

This simple numerical model consists of a square structure of brick wall thickness 230 mm of 1.96x1.96x4.0 m. Foundation is continuation of wall up to 1.5 m depth and is rest on soil layer. Soil block of 17.00x17.00x9.50 m is modeled on which structure rest as shown in Fig. 1. Concrete band is modeled in between the soil and brick foundation on four sides of varying thickness as shown cross section on Fig. 2(unit is m and not in scale). Door and windows are modeled by providing the opening in the wall. For every cases there are four models, where model 1 is without concrete band, model 2 is with concrete band thickness of 0.5 m, model 3 is of band 1.0 m and last model 4 is of 1.5 m band thickness. For simplicity, here external load for roof and other is not taken in consideration. Material properties taken from literatures (Hari Ram Parajuli, 2010) are shown on the Table 1.

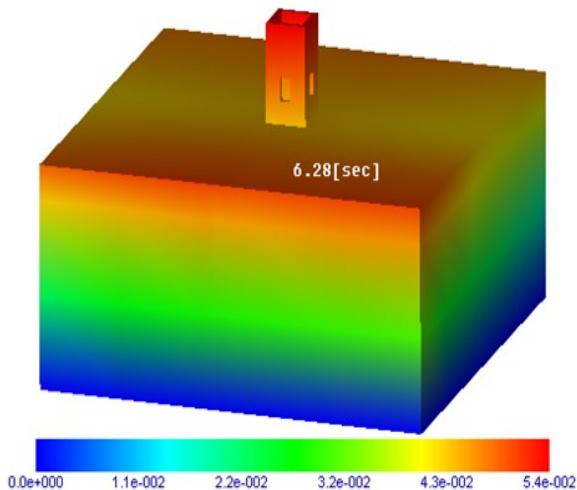


Fig. 1 3-D model

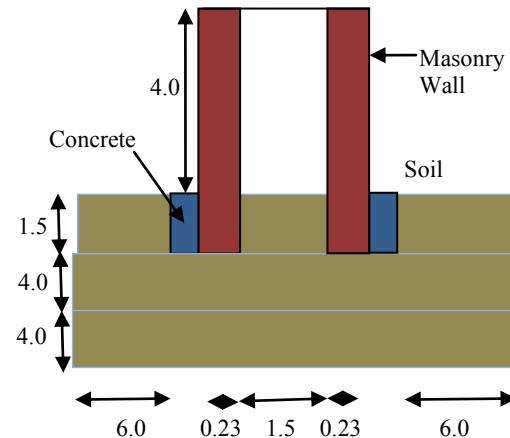


Fig. 2 C/S of model (case

Here we analyze for different three cases of the supporting soil and concrete band thickness and depth. In first case soil is modeled as totally the soft soil (soil properties of soil1) in all three layers and the concrete band provide up to depth of wall foundation only. In second case, for the same soil and structural model concrete band thickness is deeper 2 m more than first case where wall foundation depth is same, as shown in Fig. 3 (unit is m and not in scale) here soil block height is 7.5 m, less than other two models. In third case we assume that the engineering bed rock is in shallow depth so soil of bottom two layers, as model in first case has properties of soil2. In all cases and model, total numbers of nodes are 1024 with 622 total solid elements.

Soil is taken as the soft soil for two cases and also for third case surrounding of structure is soft soil even though structure rest on engineering bedrock. Input ground motion is Type231 taken as per the Japanese specifications for highway bridges for soft soil (Japan road association, 2012). Input ground motion is shown on Fig. 4. All nodes in the base of the model (169 nodes) are fixed and rests of them are free. Interaction between the soil and structure is just modeling of solid elements, no spring and joint elements are assigned.

Table 1 Material Properties

Material	Density (KN/ m ³)	Poisson's ratio	Shear wave velocity (m/ s ²)
Soil1	13	0.3	100
Soil2	17	0.3	300
Brick wall	19	0.2	402
Concrete	25	0.2	1854

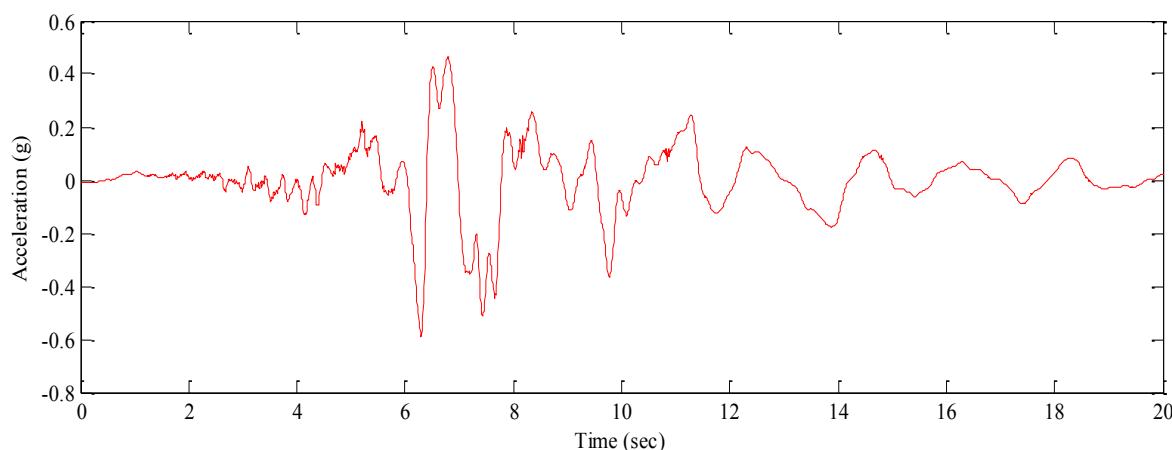


Fig. 4 Input ground motion

3. ANALYSIS

Dynamic analysis of model with finite element method was performed. In structural analysis we model the structure in mesh with 622 finite elements and total of 1024 nodes. Then analyze for all nodes of all elements taking under consideration. Equation of motion and matrices are,

$$[\mathbf{M}]\{\ddot{\mathbf{u}}\} + [\mathbf{C}]\{\dot{\mathbf{u}}\} + [\mathbf{K}]\{\mathbf{u}\} = -[\mathbf{M}]\{\ddot{\mathbf{z}}\} \quad (1)$$

Where, $[\mathbf{M}]$, $[\mathbf{C}]$ and $[\mathbf{K}]$ respectively are total mass, damping and stiffness matrices. $\{\mathbf{u}\}$ is displacement vector and $\{\ddot{\mathbf{z}}\}$ is vector of input ground acceleration. Input ground motion is assigned in three dimensions. Rayleigh damping is used on the assumption the damping of 5%. Self-weight of the material are taken under consideration. Input ground motion was used through the base of the model to excite the structure. Responses of the structure were calculated as the displacement, velocity and acceleration responses on each node and stress and strain responses in each elements. For the comparison results are taken for the top corner node. Analysis was performed one after another and here for comparison acceleration and displacement responses on X and Y directions are taken for all model and cases.

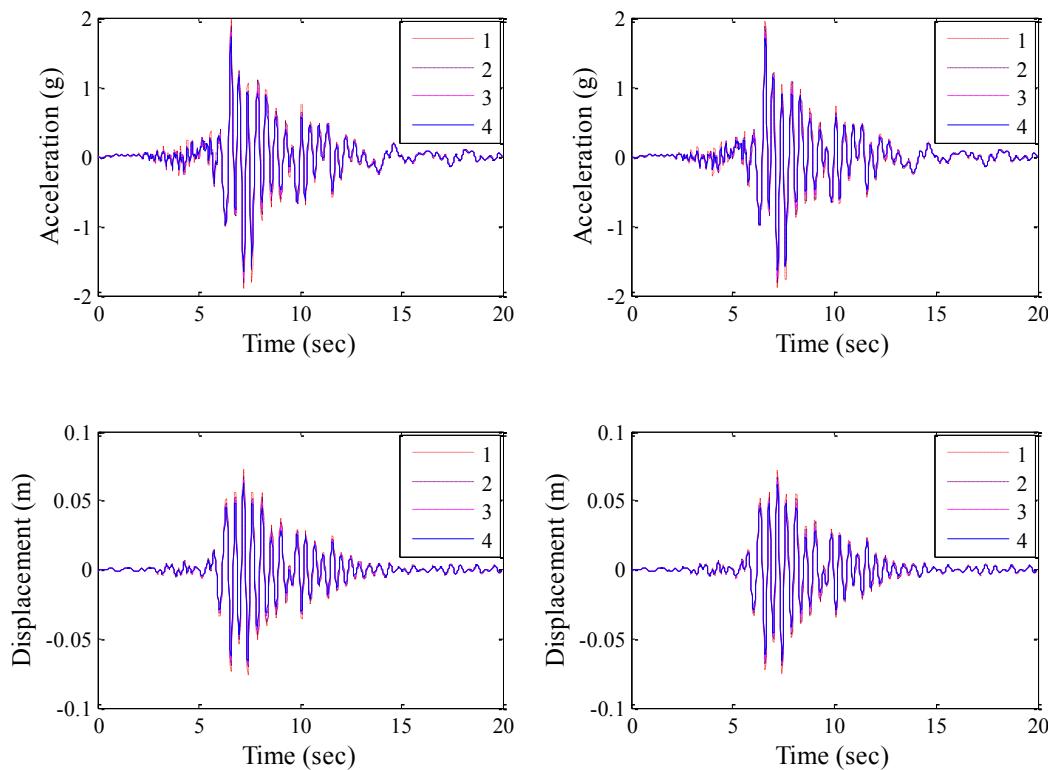
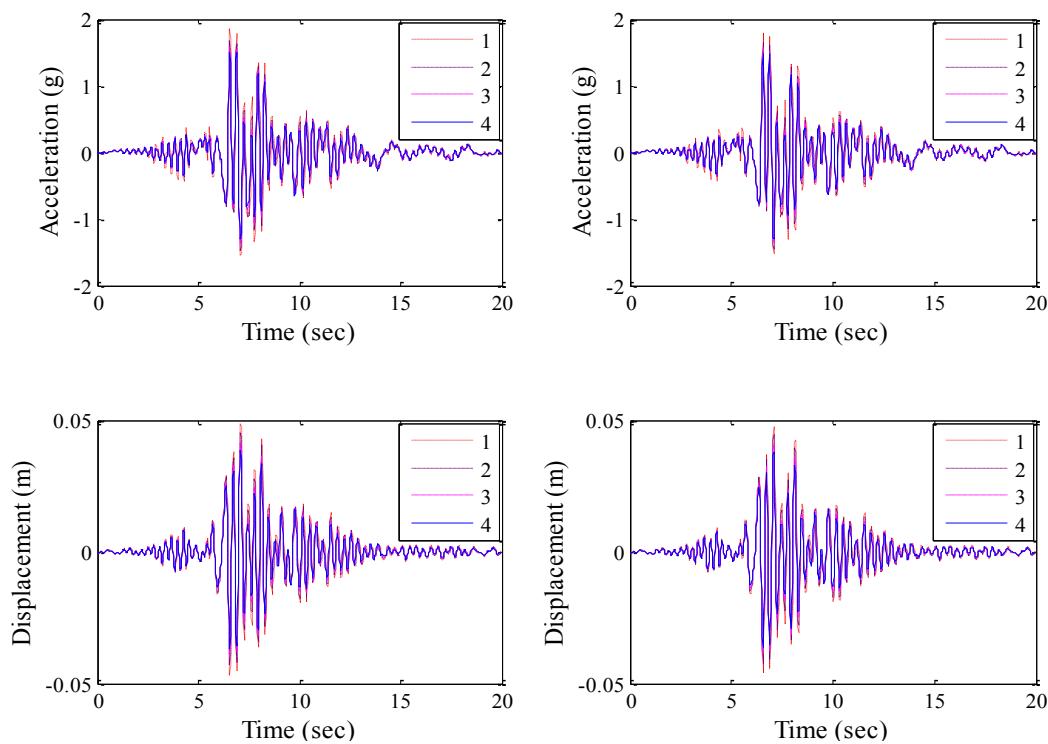
4. RESULTS

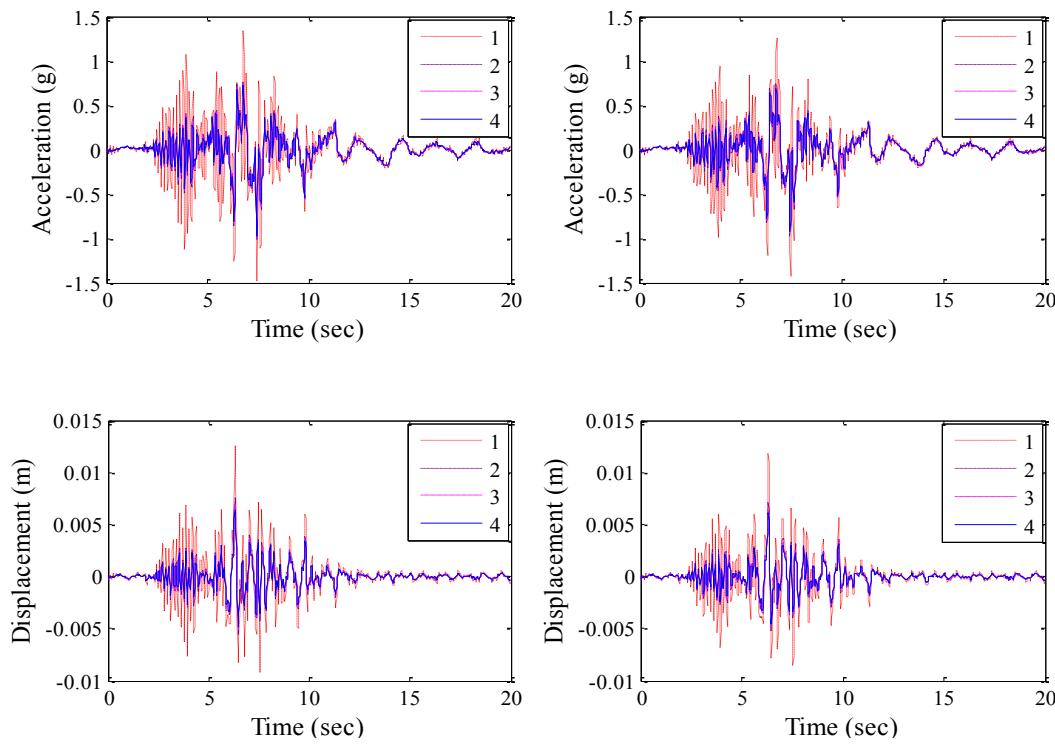
Analysis of four modes under the given input ground motion were done and the results are shown as below in figures. Here figures shows for the comparisons of acceleration and displacement for three cases and four models.

For the first case comparison of acceleration and displacement responses on x and y directions are shown in Fig. (5). Considering X direction, maximum amplification of accelerations are 1.696, 1.88, 1.79 and 1.72 and displacements 73, 67, 65 and 62 mm for models 1, 2, 3 and 4 respectively.

For the second case comparison of acceleration and displacement responses on x and y directions are shown in Fig. (6). Considering X direction, maximum amplification of accelerations are 1.85, 1.68, 1.58 and 1.57 and displacements 49, 45, 41 and 38 mm for models 1, 2, 3 and 4 respectively.

In third case comparison of acceleration and displacement responses on x and y directions are shown in Fig. (7). Considering X direction, maximum amplification of accelerations are 1.35, 0.756, 0.735 and 0.722 and displacements 13, 7.5, 6.8 and 6.4 mm for models 1, 2, 3 and 4 respectively.

**Fig. 5 Responses for case 1****Fig. 6 Responses for case 2**

**Fig. 7 Responses for case 3****5. DISCUSSION**

The comparison of result responses in x direction are tabulated here in Table 2. Maximum amplitude of acceleration and displacement for all cases and model are presented with the percentage effectiveness of such model under given case. Comparisons are made with difference to the model 1 for each case.

Table 2 comparison of responses for x direction

cases	case 1		case 2		case 3	
response	Accl.	Displ.	Accl.	Displ.	Accl.	Displ.
model 1	1.969	0.073	1.85	0.049	1.35	0.013
effect (%)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
model 2	1.88	0.067	1.68	0.045	0.756	0.0075
effect (%)	-4.52%	-8.22%	-9.19%	-8.16%	-44.00%	-42.31%
model 3	1.79	0.065	1.58	0.041	0.735	0.0068
effect (%)	-9.09%	-10.96%	-14.59%	-16.33%	-45.56%	-47.69%
model 4	1.72	0.062	1.51	0.038	0.722	0.0064
effect (%)	-12.65%	-15.07%	-18.38%	-22.45%	-46.52%	-50.77%

In first case and second case amplification of acceleration is quite more about 3.5 times whereas in third case it's up to 2.25 times in model one. The effect of concrete on acceleration amplification is more effective when bedrock is in shallow depth even the amplitude is small, amplification reduces to 46%. For the displacement responses, reductions of displacement are better for second case than first but it has more effect on third case even displacement itself is small. In first and second case both acceleration and displacements are reduces with increase in concrete band thickness. For the same soil condition second case seems more effective.

6. CONCLUSIONS

From this result we can say that the concrete band will improve the seismic performance of masonry structure. For the areas where bed rock is in shallow depth we can use concrete band which will reduce the amplification of acceleration and displacement. Also in soft soil zone larger thickness of concrete band increase the seismic performance also on increasing the depth of concrete more than foundation level, will provide better effect. In future, we can do the analysis for the full structural model considering all forces act on structure and can see the best way to increase the seismic performance of old masonry buildings.

REFERENCES

1. Parajuli, Hari Ram et al. (2010). "Parametric study and dynamic analysis of a historical masonry building." *Disaster mitigation of cultural heritage and historic cities*", Vol.4, 149-156.
2. Japan road association (2003). "Specifications for highway bridges, V Seismic Design", Maruzen.
3. Furukawa, Aiko et al. (2010). "Study on seismic behavior of a historic masonry building in Nepal." *Disaster mitigation of cultural heritage and historic cities*", Vol.4, 141-148.

POLITICAL ELITE CAPTURE SYNDROME IN CITIZEN PARTICIPATION

Perspectives from Nepalese Local Governance

Suman DAHAL

GraSPP, MPPIP, The University of Tokyo, Email: suman2034@yahoo.com

ABSTRACT: Community led development is committed to serve the local people through service delivery by people's organizations and communities. Elite capture is a phenomenon where resources transferred for the benefit of the masses are seized by a few, usually politically and /or economically powerful and influential local groups. Nepal is practicing decentralization concept through different community led development mechanism that strengthens the citizen participation but due to the elite and political capture in decision making process, the intended results is not accomplishing. Due to political instability and lesser speed development of the country, unemployment has been rising up. In each and every decision, political and elite influence is notable which is hindering the real participation and excluding the marginalized and suppressed people from the decision making arena.

Though the enactment of LSGA, it was intended to assure the real participation in local development process but due to direct and indirect influence and power of local political and elite people, it is not going well. To make real and meaningful participation of marginalized and poor people, there should conduct targeted and result based program through awareness and education based, persuasive and community mobilization program.

1. BACKGROUND

Nepal is a small south Asian Himalayan country having 147181 square km land area with about 30 million populations which locates between China and India. It is also known as a country of Mt. Everest (8848m) and the birthplace of Lord Buddha. Although, economically it is least developed but regarding the natural resources, it is known as one of the richest country in the World.

Politically, Nepal has divided on 75 districts out of which, there are around 90 municipalities and around 3900 villages in the country. Districts, municipalities and villages are collectively known as local bodies (LBs) in Nepal. In district level, there is a mechanism of District council which is a forum of elected member and also has District Development Committee which stands as an executive committee for the district. Under the committee, there are several employees working for local governance. Similarly, municipality and village also has the same structure. Since 2002, there is not held the election for local bodies and daily operation is going on through a mechanism in which members from all party are there and through the advice and decision of the mechanism, the local bodies are working on.

Nepal had been adopting a unitary governance system but after the re-instate of peoples' democracy on 2006, it is going to adopt federal system. The process of involvement and association of local people in local planning and development process began in the 1960's through establishing country wide network of local bodies (LBs) which exercise the decentralization program. At present after the enactment of Local Self Governance Act (LSGA) 1999, it has a more clear legal framework that deals with the powers and functions of the LBs which is considered to be a framework in resolving conflicts through the provision for participation of poor, women, suppressed and marginalized people who are less powerful and disadvantaged group of the society in the decision-making processes.

2. CONCEPTS

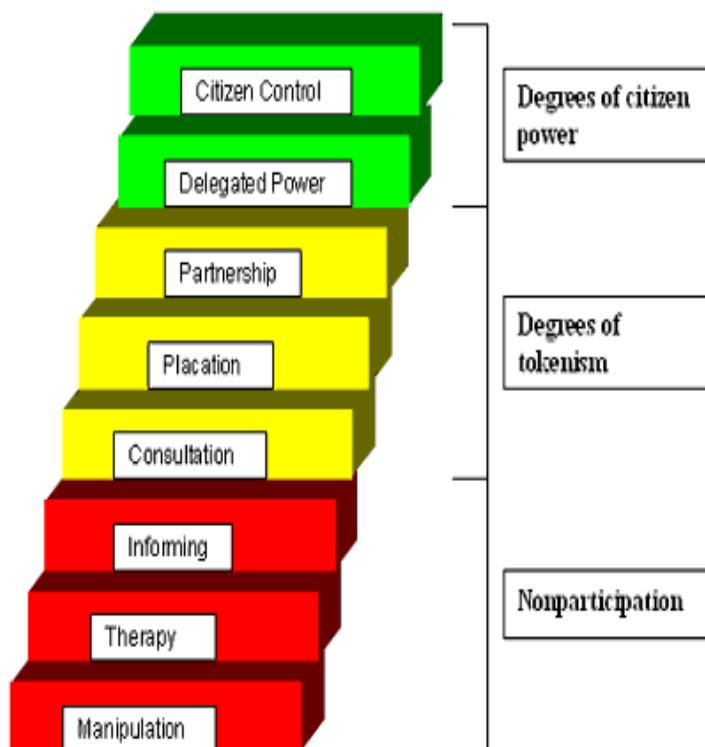
2.1 Elite Capture

Elite capture is a phenomenon where resources transferred for the benefit of the masses are seized by a few, usually politically and /or economically powerful groups. Elite capture syndrome arise when there is a selection bias through which some people/social groups of the village have benefited from public services and others who have not. Selection bias implies that there is a pattern to this selective decision on distribution of social benefits. The pattern could be defined by caste status (an upper caste social group can discriminate against lower caste groups in the village); by political party affiliation; by economic position etc. This situation constitutes a case for elite capture, where certain segments of the village population experience reduced access to public goods than others. One common disadvantage of the decentralization process is the phenomenon of elite capture, especially in developing countries. (Divya Dutta)

2.2 Citizen Participation

Citizen participation is a mean for involvement of people which exerts decisive power in local projects. Different social actors do interaction between citizens and local authorities during the project cycle. However, the structure and processes for participation do matter which defines about spaces, actors, agendas and procedures etc. Sometimes, these structure and processes can hinder the effective involvement of citizens in development process.

According to Arnstein, there is eight levels of participation from lower rung manipulation to the highest rung citizen control with delegated power. Each rung in the ladder reflects the amount of citizen power exercised. Manipulation is a case of non-participation which distorts participation into a public relations vehicle by power holders. Citizens are placed on rubberstamp advisory committees which emphasize “information gathering”, “public relations”, and “support”.



(Ladder of Citizen Participation by Arnstein)

Therapy refers as powerlessness and apathy or mental illness in local people, therefore people need to “participate” in group therapy or other activities that can cure their pathology. It does not attempt to change the conditions or factors that create people’s “pathologies”.

Informing is token participation because it provides only one-way communication. There is no mechanism for feedback and negotiation. Informing is done through public address systems, mass media, and responses to inquiries.

Consultation is token participation done through the use of attitude surveys, neighborhood meetings and public hearings, offering no assurances that citizen ideas will be taken into account.

Participation is measured in terms of attendance of meetings, responses to questionnaires, brochures received. Placation is a higher kind of tokenism, which can be described as suffering from “*meetingitis*” and “*projectitis*”. It allows citizens to advise or plan in a project but no legitimacy of feasibility of advice. There may not be any mechanism for ensuring continued participation during the implementation stage.

In partnership, power is redistributed and this is done through negotiation between citizens and power holders via joint planning boards and other mechanisms for resolving impasses.

In delegated power, more citizen power is exercised than in partnership because citizen vote is provided for if differences of opinion cannot be resolved through negotiation.

Citizen control represents that rung of participation where citizen or people’s power is greatest. It guarantees that participants can govern a program, can be in charge of policy and managerial aspects, and can negotiate the conditions under which “outsiders” may change them. The neighborhood corporation with no intermediaries between it and the source of funds exemplifies citizen control.

2.3 Corruption

Literally, corruption refers to be unethical and dishonest to the loyalty. We have one popular proverb that power tends to corrupt and absolute power corrupts absolutely. Hence, we can say that where there is a power or authority, there will be a high chance to happen corruption. Transparency and accountability are the enemy which can eradicate or wipe out the corruption. If we increase transparency and strengthen accountability measure then the intensity of corruption starts to decline and ever eradicate based on the level of transparency and accountability held.

2.4 Decentralization

Decentralization is the tool which ensures democratic governance that pre-requisite for effective and efficient public administration. Since, it believes in free and fair election and makes the elected bodies more decisive and collaborative with national and regional authorities, we can say that it express the crux of good governance. Decentralization can positively increase government responsiveness to the poor and pro-poor development but this is dependent up on various separate variables.

2.5 Advocacy planning

Advocacy planning is an campaign or more specifically an advocacy against the readymade plan. To enhance local participation on planning process, this model takes the perspective that there are large inequalities in the political system and in the bargaining process between groups that result in large numbers of people unorganized and unrepresented. It concerns itself with ensuring that all people are equally represented in the planning process by advocating for the interests of the underprivileged and seeking social change. Again, public participation is a central tenet of this model. A plurality of public interests is assumed, and the role of planner is essentially as facilitator who either advocates directly for underrepresented groups directly or encourages them to become part of the process. (source- wiki)

2.6 Community led development

Literally, community led development can be understand as a development process leading by the local community which guarantee effective local participation with proper vision, know-how, capabilities and experience to confront and solve the problems of underdevelopment. Community development theory is committed to serve the local people through service delivery. It focuses on their economic survival as well as of local empowerment and self-organization. We know that Development refers to positive change from latent or previous condition to a more advanced or effective condition. The community development perspective places the responsibility for the development of community on the people.

3. ANALYSIS

Although, it has not so long history on substantial practice of decentralization, but it is more than one decades of Local Self Governance Act (LSGA) 1999. Nepal is a country where we can examine various problems in decentralization programs because the country is administratively centralized yet and it has not enough access to effective local participation which encouraging the corruption on local level by the local elites.

The donor-backed scheme depends on local “user groups” and “consumer committees” to provide accountability. But informants say these tend to be captured by political interests. Indeed, struggles between political parties for control of these bodies are a cause of violence in some districts. (From Economist : Aid and corruption in Nepal; Low road through the Himalayas May 31st 2011, 15:43 by T.B. | KATHMANDU)

Although, decentralization has been promulgated through different progressive policies and mechanisms but it has been leading and managing by the ruling political and local elite group which arise difficulties involved in setting priorities, planning, and implementing programs at district and village levels. There is a dangerous scenario of elite capture of local programs by local political and elites including local officials. Due to heavy control by the central government over many financial as well as project selection decisions, local participatory channels are being paralyzed.

In many cases, due to the elite capture syndrome, there is happening a kind of ritual and doing of formality during the program operation.

Community-based development has been criticized for its inadequate understanding of power relationships at the local level, which thus leaves room for elite capture. While the ‘counter-elite’ approach is not necessarily

effective in challenging elite domination, because of the structural asset dependence of poor people on the elites, the 'co-opt-elite' approach risks legitimizing the authority of the elites and worsening poverty by implementing 'anti-poor' policies. (Sam Wong, 2010)

Due to the violation of legal provision, there is a kind of tense situation and a kind of mobocracy we can see in Nepalese local operation. During the working in local development, in each and every day, Officials are surrounded by local political leader and elite whose demands are to get fund for their different fantasy and imaginary projects. Although, there is a legal provision to guarantee the participation of people from all level such as women, poor, socially and economically marginalized group but by the influence and power of local political elite people, they all are only doing signature and acting as a statue. They never argue and make debate. Of course, sometime they also get some money from the user committee as an allowance. Practice of user committee in Nepal seems like a distribution channel of development fund to local political cadre and elites. In the meantime, government officials are also searching an opportunity for making money by manipulating the situation.

The apparent gap between the promise of enhanced participation through democratic decentralization on the one hand, and the everyday realities of participatory politics on the other, suggests the need to understand more fully the barriers and dynamics to participation in local governance, as well as the enabling factors and methods that can be used to overcome them.

KATHMANDU, AUG 24, 2012 - The Ministry of Federal Affairs and Local Development is preparing to suspend 21 civil servants working in Dhanusha and some VDCs in the district for misusing funds. (Kantipur Daily)

The other form of corruption can be observed in the formation of the User's Committees (UCs) as well. Development projects up to Rs 6 million should be implemented by the UCs whereas project above the threshold needs to be contracted out through competitive bidding. This mandatory provision is a good concept as it encourages local community and beneficiaries' to own, monitor and participate in the execution of development works. But this noble UCs' concept has ended up as a tool for the local politicians to misuse public funds. There is no transparency in formation of the UCs and political parties enlist their men as members to these committees. Target beneficiaries and local people are often kept at bay during the UCs' formation process. Thus, the real challenge ahead is to reduce "politicization" and limit political dominance in these most vulnerable and lucrative committees. The other problem with the UCs is that some of them are sub-contracting development works which is against the law. (Pranav Bhattacharai)

We can find number of barriers to citizen participation in local governance. Power relations among the people and organizations are the most prevalent indicator. Due to power difference (PD) factor, lower level and marginalized people cannot debate and negotiate with local elite which hinders the effective participation. Participatory Skills is another indicator which may be a barrier to local participation. Marginalized and poor people may not participate well due to lower or inefficient participatory skills. Political will is another barrier which hinders the effective participation and it directs the development process on the profit of their party workers or followers. If there are insufficient financial resources at local level, then also it will be difficult to produce good participation. Of course, level of participation also does matter. Our objective is to attain citizen control rather than symbolic participation. (Gaventa et al., 1999)

Shortcomings in conventional accountability systems are well known, and yet the monitoring of government performance and level of response to public interest is still deemed critical to effective local governance and service delivery. Lack of transparency in budgetary procedures makes it especially hard for the electorate to judge government spending records. Similarly, within government good information flows are key to effective institutional checks and balances. It is critical not to underestimate the importance of organizational systems and structures to provide the right incentives to improving that flow. (Ursula Grant, 2002)

4. CONCLUSIONS AND RECOMMENDATIONS

To overcome the barrier and produce effective participation, we have to make some strategies and have to take some strong approaches. Citizen education and awareness building can be an effective strategy which empowers the local people. Through this strategy, people can have knowledge and information about the development project and procedure. They can negotiate and talk easily which can produce effective participation. Sometimes, lack of information and skill of local official also hinder the participation process and at that time, we can use training and sensitizing strategy for local officials which can enhance their knowledge, skills and may produce attitudinal change towards local development. As earlier as there should be done local election that will identifies the legal framework as well as promotes the accountability of elected officials to citizens. We have not to forget to get

meaningful and effective participatory budgeting system too.

Exclusively, counter-elite or co-opt-elite style may not produce real participation in all cases. Also it is hard to say that shifting community-based projects from elite driven to community-focused certainly harvest effective participation in all situations. It certainly depends up on social development stages and cultural shift too.

For social inclusion and equitable development, it is necessary to include the marginalized and excluded persons within the process through number of options. First, Yes! Elites can be absorbed and challenged in the same project at the same time but more time should be given to observe and to conduct proper participatory appraisal exercises in order to have a deeper understanding of the underlying power structures in the communities. Second, by reducing the land and other asset dependence of the poor by seeking alternative livelihoods can offers a necessary condition to break the patron-client relationships. Third, the process of challenging elite domination can only be sustained if the poor are genuinely empowered and they feel that this can make a difference to their lives. Fourth, NGOs and other development agencies should maintain their high power-sensitivity and ethics. They should continuously provide support to local people in order to monitor the influence of the elites over the development processes.

REFERENCES

1. Dwarika Nath Dhungel, Mahendra Raj Sapkota and Marit Haug with Pradyuman Prasad Regmi Decentralization in Nepal: Laws and Practices
2. <http://www.nibr.no/filer/2011-23.pdf>
3. John Gaventa and Camilo Valderrama, Participation, Citizenship and Local Governance Background note prepared for workshop on .Strengthening participation in local governance. Institute of Development Studies, June, 1999
4. Diya Dutta, Elite Capture and Corruption: Concepts and Definitions Bibliography with an overview of the suggested literature
5. Ursula Grant, Local Government Decision-Making: Citizen Participation and Local Government Accountability A Literature Review by, International Development Department, University of Birmingham, March 2002
6. Ghazala Mansuri and Vijayendra Rao, Localizing Development, Does Participation Work? The World Bank, 2013
7. Sam Wong, Elite Capture or Capture Elites? Lessons from the ‘Counter-elite’ and ‘Co-opt-elite’ Approaches in Bangladesh and Ghana, July 2010
8. http://www.wateraid.org/documents/plugin_documents/local_financing_nepal.pdf
9. Pranav Bhattacharai, Messy Local Governance in Nepal, on December 29, 2010 <http://voices-against-corruption.ning.com/profiles/blogs/messy-local-governance-in>
10. Editorial, Corruption in the local bodies,
11. http://www.gorkhapatra.org.np/rising.detail.php?article_id=44197&cat_id=7)
12. The underdog among the corrupt, 05 December 2012
13. <http://www.peoplesreview.com.np/index.php/articles/obvious-or-otherwise/>
14. http://en.wikipedia.org/wiki/Urban_planning#Advocacy_planning
15. <http://www.historynepal.com/>

एक प्रयोग

भोगेन्द्र मिश्र

बिहान को ९:३० बी सकेको छ। ब्रेकफास्ट तयार गरेर उसको ढोका नक गरे, भित्र बाट कुनै प्रतिक्रिया नआए पछि, ढोका खोलेर हेर्दा सिरनीलाई कखी च्यापेर मस्त निदाइ रहेको थियो। उ रातभर नसुतेको कुरा मैले उसको झन्डै एक एक घण्टामा गरेको फेसबूकको पोस्ट हेरेर थाहा पाई सकेको थिए। नउठाउननै बेश शम्ज़ेर फेरी ढोका बन्द गरेर एकलै ब्रेकफास्ट गरेर म निस्के।

झन्डै दुई घण्टा को काम सकेर डोर्ममा फर्किदा अशल निनाउरो मुख लगयेर सोफामा बसी रहेको थियो। उ सँग कुरा गर्ने कुनै नैतीक साहस आएन म सँग। दुई दिन देखि उ यस्तै छ, नारायण गोपल, अरुण थापा, अरुणा लमा, मुकेश का गीत हरु नै उस्का साथी भएका छन्। हुन पनि किन नहोस् त, कति सपना देखेको थियो उसले, कति योजना हरु सुनाएको थियो उसले हाम्रो सानो चौतारी मा (पढाई र काम को व्यस्तताले एउटै फ्ल्यट मा बसे पनि हाम्रो खासै कुरा गर्न समय मिल्दैन थियो, तेसैले डिनर को समयमा हामी अल्ली लामो समय डाइनिङ टेबलमा बसेर दिनभरीका रमाइला कुरा तथा समस्या हरु सेयर गर्ने गरथ्यौ र तेसलाई चौतारी नाम दीइएको थियो)

पछिल्लो हप्ता उ अल्ली धेरैनै उधेलित देखिन्थ्यो अनिकलाई भेट्न को लागि। साचै भनु भने उनको बारेमा यती धेरै कुरा गर्थ्योकी मलाई उसको कुरा सुन्न झर्को लाग्नथाली सकेको थियो। आफ्नो सेमेस्टर ब्रेकमा त्यो पनि जीवनमा पहिलो पल्ट प्रेमिका लाई भेट्ने र उनीसंगै फुकेट, क्रेबी, फिफी जस्ता थाइल्यान्ड का नामचलेका बीच हरु घुम्ने बन्दो बस्त मीलाई सकेको थियो र अर्को हप्ता आफ्नी प्रिय अनिकालाई सुबर्णभुमी एअरपोर्टमा रिसिब गर्ने अठोट उसले मलाई धेरै पल्ट सुनाइँ सकेको थियो। उसको त्यो व्यग्र प्रतिक्षा देखदा सम्पूर्ण कुरा साफ साफ भनिदिउ जस्तो पनि लाग्थ्यो तर पनि भन्न सकी रहेको थीइन मैले।

बैंकक आएको झन्डै एक महिना पछि उसले मलाई आफु कसै सँग प्रेममा परेको कुरा सुनाउदा रमाइलो लागेको थियो। तेस पछाडि हरेक दिन जस्तै हाम्रो चौतारीमा अनिकाले प्रबेश पाउँथिन, म पनि निकै ध्यान दिएर सुनेको देखदा हल्का एकजाजरेशन गर्थ्यो। झन्डै दुई हप्ता को कुराकानी र आलिक निकटता पछि अशलले मेरो फोटो हेर्ने इच्छा प्रकट गर्दा शुरुमात मलाई निकै अप्ठेरो परेको थियो। दुई दिन लगाएर कम्प्युटर मा एउटा फेश तयार पारे र त्यो फोटो लाई msn मा अपलोड गर्दा उ निकै खुशी भएको थियो। उसले मेरो प्रश्नसामा कुनै कसर बाँकी रखेन, आँखा ऐशोर्या राये को जस्तो रे, ओठ एन्जेलिना जेली को जस्तो रे, अनी फिगर कत्रिना केफ को जस्तो भन्दा उसले मलाई चिन्यो की जस्तो लागेको थियो। तर आर्को दिनको चौतारीमा उसले आफ्नी अनिका को सौन्दर्य को खुलेर प्रश्नशा गरेको सुन्दा एकतिर अली ढुक्क भएको थिए भने अर्कोतिर हासो पनि लागि रहेको थियो।

अनिका सँग गरेका हरेक कुरा हरु सेअर गर्ने र नेक्स्ट डेटिङ मा येस्तो कुरा गर्ने प्लान छ भनेर सल्लाहा माग्ने म बाहेक कोही थिएन उसको नजरमा। धेरै पल्ट हामी सल्लाह गर्थ्यो अर्को पटक यस्तो कुरा गर्दा राम्रो होला र यस्तो कुरा गर्दा यसरी रेस्पोस्न्स गर्नु पर्छ भनेर।

मिड-टर्म को व्यस्तताले गर्दा धेरै कुरा हुन नसके पनि उसले ग्याप हुन दिएको थिएन र चौतारी मा बस्दा हरेक सँझ मिस गर्थ्यो अनिका लाई। Presentation मा पाएको complement सुनाएर दँग पार्ने कोशिस गर्थ्यो मलाई र मैले पनि खुशी व्यक्त गरिदिन्थे र उसको Potential को प्रश्नशा पनि।

म चौतारी मा बस्दा अनिका को फेसबूक अनी hi5 जस्ता सामाजिक सञ्जाल मा कस्ता पोस्ट हरु आउछन भनेर सोद्दा, असजिलो मान्दै नेटवर्के मै छैन यार भन्थ्यो। अनेक पल्ट msn बाट पाएको त्यो तस्बिर हेर्दै आफुलाई मिठो कल्पना मा ढुबाएको पनि देखेको थिए, र त्यो सब देखदा प्रेम अन्धो हुन्छ भन्थे साँच्चै रहेछ

जस्तो लाग्थ्यो।

बितेका झन्डै ५ महिना म अनिका हुन धेरै धेरै नै गाहौं भएको थियो मलाई। उस्का सबै कुरा हरूलाई फिमेल साइकोलोजी बाट बुझेर Answer गर्न धेरै मेहेनेत गर्नु परेको थियो मलाई। यस बीच मा उसले धेरै पल्ट भोईस च्याट र भिडियो च्याट गर्ने कोशिस नगरेको होईन, कहीले वेब क्यम नभएको, कहीले मैक्रोफोन नभएको त कहीले आवाज म्युट गरेर आवाज न आएको तथा कहीले लेख्ननै रमाइलो भई रहेको बाहना बनाउदै पर सारी रहेको थिए ती सब कुरा हरू लाई।

हरेक कुरा म सँग नै शेयर गर्ने भएकाले अर्को डेटिङ मा गर्ने कुरा हरू अगडिनै थाहा हुन्थ्यो जसले गर्दा नै यति लामो समय सम्मा पनि यो सब कुरा भेत पाउन सकेको थिएन उसले। हुन पनि मैले धेरै होसियरी अप्नएको थिए। कहीले पौढी मा जाने भनेर ल्यब मा गएर साइन इन गर्थे, नेपाल को लोड शेडिङ लाई पनि कन्ठस्थ परेको थिए, डोर्म मा बसेर च्याट गर्दा निकै होसियारी अन्नाउथे र history लाई क्लेअर पारिहल्थे। समय बढ्दै जाँदा उसको पागल पनि बढ्दै गयो, यति सम्म की अनिकाको फोटो सँग आफ्नो फोटो राखेर कम्प्युटर को डेस्कटप अनी मोबाइल को स्क्रीनमा रख्थ्यो। फेसबूक मा सबै रोमान्टिक पोस्ट हरू पढ्न पाइन्थ्यो। अनिका को याद मा डेढेको तरकारी धेरै पल्ट खानु परेको थियो मैले, अनी उनै को याद मा साइकल रुख मा कैयौं पल्ट ठोक्कायको पनि देखे। उ यति धेरै क्रेजी भयो की मैले अनिका छैदै छैन बिर्सी भन्दा त मेरो लभ देखेर जेलस भएको भन्थ्यो। अब त मलाई बल्ल लाग्न थाल्यो की मैले कतै गलत त गरिरहेको छैन। धेरै पल्ट साचो कुरा भन्ने कोशिश नगरेको पनि होईन तर उसको पागल प्रेम देखेर केही भन्ने आट नै आएन, बिस्तारै कम्युनिकेसन ग्याप गर्ने र एकाएक गयब हुने बिचार गर्दै थिए, उसले एकाकी बैंकक को निमन्त्रण दियो।

मैले म प्रतिघिणा जगाउने उत्तम उपाय देखेर बैंकक आउने कुरामा समर्थन गरिदिए। उ खुशी ले नच्यो, मलाई उ प्रति आँफै ले गरेको व्यवहर देखेर दिक्क लाग्यो। मैले सोच्नै सकिनकी कोही मनिष प्रेम मा यति सम्म पागल हुन सक्छ भनेर। उसको खुशी को सीमा थिएन, यता मलाई पश्चातप। म उसलाई अनिका आउने बारेमा शन्का व्यक्त गर्दा उसले त्यस बिषयमा कुरा गर्ने दिएन। उ फुकेट, क्रेबी अनी फिफी घुम्ने सपना देख्यो, अनी Central World and Siam Paragon मा अनिका सँग शप्पिङ गर्ने योउजन सुनाउथ्यो, म हरेक पल्ट शंका व्यक्त गर्दथे तर उसलाई कुनै शंके थियन।

शुक्रबार भिला मा हाप्पी फ्राइडे सेलिब्रेट गर्ने योजना बन्यो, रात को ९ बजे हामी भिलाका ३ जाना भएर लिविङ म बस्यौं र रेड लेवेल को चुस्की सँगै रमाइलो जोक्कस अनी जनरल कुरा हरू हुँदै गय, ११ बजे सम्मा बोत्तल खाली भई सकेको थियो। सबै जना झन्डै होस गुमाई सकेको र अरु ड्रिङ्क्स न भएको अवस्था मा अर्को हल्फ थप्ने कुरा भयो। कलेज कम्पाउन भित्र अल्कोहोल किन्न नपाउने भएको ले बाहिर को १०८ सप मा तिनै जना गयौ। हाफ रेड लेवेल सँग केही स्नेक्स लिएर आयौ र फेरी एक एक पेग बनाएर शुरु गर्यौ। अशल अनिकाको याद मा डुब्न थली सकेको थियो, यत्तिकै मा उसले आफुलाई अनिका सँग तत्कल कुरा गर्न मन लागेको तर सम्भब न भएको कुरा व्यक्त गरे पछि मैले पनि नसा को शुरमा २१ औसतब्दीमा केही कुरा पनि अशमभब नभएको भन्दै ल तँ तयार भ, म तेरी अनिका सँग कुरा गराइ दिन्छु भन्दै आफ्नो ल्यापटप को msn मा username : anikaa and password : forashal enter गरेपछी अशल को कम्प्युटर मा अनिका इज अन्लाईन को pop up मेसेज display भयो। यत्तिकैमा शिशा फुटेको छिनिड आवाज आयो, म झसँग भयर हेर्दा अशल को हतमा ग्लास थिएन अनी उसको आँखा बाट बगेको आँशु गाला हुँदै तल हामफाली रहेको थियो अनयसै मेरो मुख बाट आवाज निस्कियो सरी अशल।

हाइकु समाट माचुओ बाशो

प्रकाश पौडेल माइला

अध्यक्ष, अनेसास, योकोहामा जापान, poudelprakash575@hotmail.com

माचुओ वाशो (१६४४-९४) हाइकु साहित्यका आधार स्तम्भ हुन । हाइकाइ-ताडका) का विशिष्ट कविका रूपमा समेत कहलाएका वाशोले हाइकाइ ३१ अक्षरीय लाई १७ अक्षरीय ५-७-५ उत्कृष्ट लघुत्तम रूपमा प्रस्तुत गरेर जापानी वाडमयमा सुनौलो आयाम थपे । तेइतोकु र दानरीन शैलि गहनताका साथ बुझेर हाइकाइका क्षेत्रमा थप निखारता ल्याए । वाशोलाई हाइकु समाट भनिन्छ । एदो कालका अगाणी कवि वाशोले यात्रा गरेर हाइकु लेख्न रुचाउँथे । वाशोका सात वटा कृतिहरु सग्रहका रूपमा प्रकाशित भएका छन् ।

हाइकु समाट माचुओ वाशोको जन्म सन १६४४ मा तत्कालिन इगा प्राप्तको उएनो भन्ने ठाँउमा भएको हो । उनि सामुराइ परिवारका सदस्य हुन । उनका पिता तल्लो स्तरका लडाकु दस्ता थिए । जम्मा सात छोरा छारीमा वाशो कान्छा थिए । उनका पिताले वाशोलाई पनि लडाकु दस्तामै भर्ना होओस भन्ने चाहन्थे । तर सानै उमेर देखि नै लेखनमा रुचि राख्ने वाशोले वुवाको रुचि तर्फ त्यति चासो दिएनन । स्थानीय जमिन्दार तोदो योशिदाताको घरमा जागीरे बैठके रहेका वाशोले सन १९६६ मा पदबाट राजिनामा दिएका थिए । तोदो योशिदाताको घरमा जागीरेको रूपमा छँदा त्यो परिवारका गुरु कितामुगा किगिनसङ्ग कविता लेख्ने कला सिकिसकेका थिए वाशोले । कलिलो उमेरमा नै कविता विशेष गरी हाइकाइको बारेमा राम्रो ज्ञान पाएका वाशो तेह वर्षको हुँदा सन १६५७ मा लेखिएको कविता नै उनि रारा लिखित प्रथम अभिलेखात्मक कविता मानिन्छ ।

जापानी सँस्कारमा प्रत्येक वर्ष एउटा न एउटा जनावरको नाम विशेष वर्ष हुन्छ । बाह्र वर्ष सम्म क्रमिक रूपले चक्र घुमिरहन्छ । यस्तै क्रममा सन १६५६ बाँदर वर्ष सन १६५७ चरा वर्ष र सन १६५८ कुकुर वर्ष परेको सन्दर्भमा बाशोद्वारा लिखित पहिलो कवितालाई साहित्यकार क्षेत्रप्रताप अधिकारीले सत्र अक्षरीय सरचनामा यसरी बदल्नुहुन्छ ।

साथी रहेछ
बाँदर कुकुरको
यो चरा वर्ष ।

अहिले आएर वाशोलाई हाइकु कविका रूपमा चिनिए पनि तत्कालिन समयमा यिनि होक्कु कविको रूपमा प्रख्यात थिए । किनभने हाइकु नमाकरण गर्ने कवि त उन्नाइसौं शताब्दीका मासाओका शिकी १८६७ -१९०२ हुन् । वाशोले कति वर्षको उमेरबाट हाइकु लेखनारम्भ गरे भन्ने विषयमा इतिहास नै प्रस्त छैन । कसैले सन १६५७ मा लेखिएको कवितालाई नै हाइकु लेखारम्भ भनि टिप्पणी गर्छन भने कसैले १६६२ १८ वर्षको उमेर बाट लेख्न थालेको धारणा राख्दछन् । हाइकु विद प्रा. राम कुमार पाँडे चाँहि १८ वर्ष केटौली उमेर देखि नै वाशोले हाइकु लेख्न थालेको कुरालाई समर्थन जनाउनु हुन्छ ।

सन १६५६ मा आफ्ना पिता गुमाएका वाशोले सन १६६६ मा तोदो योशिदातालाई समेत गुमाए । उनले एकलो महसुस गर्न थाले । चिन्तित भए । योशिदाताको निधन लगत्तै उनको राजिनामा आयो । सन १६७२ मा वाशो एदोमा बसाई सरे । तत्कालिन एदोलाई हाल टोक्यो भनिन्छ । ग्रामिण बसाइ भन्दा शहरीया बसाइमा उनले व्यक्तित्व विकासको लागि अवसर र सम्भावना दुवै देखेको हुनु पर्छ । एदो वसाइका सुरुका दिनहरु कष्टप्रद बने । साहित्यिक गतिविधिमा भन्दा सेइखाचुको लागि झिना मसिना काममा अलिङ्गन पुगे । तर पनि लगनशिलता र प्रतिष्ठाले गर्दा त्यहाँ उनले एउटा हाइकाइ सकलन तयार गर्न अवसर प्राप्त गरे । प्राचिन सस्कृति र लयलाई प्यारोडीका रूपमा पनि निकाले । झन प्रतिष्ठीत र चर्चित बन्दै गए ।

एदो प्रवेशको दुई वर्षपछि वाशोले हाइकु पाठशाला खोले । उनी हाइकुको सेन्सेइ बने । उनको पाठशालामा थुपै विद्यार्थीहरु हाइकुका बारेमा पढन आए । वाशोको पाठशालामा पढन आउने पहिलो व्यक्ति किकाकु नाम गरेका व्यक्ति हुन । जो पछि नाम चलेका कविका रूपमा गनिए । पाठशाला खोलेपछि वाशोलाइ झन धेरैले चिन्दै गए । पाठशालाहरु बिस्तार गरिए । चेलाहरु बढे ।

सन १६८० मा उनले आङ्गना २० जना चेलाको उत्तम कविताहरुको सकलन प्रकाशन गरे । यि २० जनामा सबै जसो अल्लारे युवा कविहरु थिए । यसको प्रकाशनबाट चेलाहरुलाई थप हौसला मिल्यो भने वाशो पनि उत्साही बने । वाशोले जेनवादी चिन्तनको बारेमा धेरै सोधि खोजी गरे । आध्यात्मिक ज्ञान समेत लिए । उनलाई यस कार्यमा सघाउने प्रमुख व्यक्ति उनकै छिमेकी बुचो थिए । शहरीया भौतिकवादी जीवन वाशोलाई मन परेन । येश त मिल्यो तर शान्ति मिलेन । सन्तुष्टि भएन । त्यसैले उनी यात्रामा निस्कने निचोडमा पुगे । यात्रा आरम्भ गर्नु अघि फुकागावा बसाइ सरे । जहाँ उनलै आङ्गनो नाम वाशो राखेका थिए ।

वाशो एक नाम अनेक

त्यसबेला जापानमा उपनाम राख्ने लहर चलेको थियो । साहित्यकर्मि कला कर्मि मात्र हैन तत्कालिन राजनितिक अनुहार र युवा जमात पनि उपनाम राख्न निकै अगाडि देखिएका थिए । यो लहरले वाशोलाई पनि छोएको देखिन्छ । वाशोको बाल्यकालको नाम किनसाकु थियो । माचुओ मुनेफुसाको नामबाट पनि उनलाई धेरैले चिने । जन्मथलोबाट लत्कालिन एदो हाल टाक्योमा बसाइ सरे लगत्तै नाम तोसेइ राखेका थिए यिनले । सोबो नामबाट पनि प्रशस्त हाइकाइ लेखे । अन्तमा उनलाई चिनाउन सबैभन्दा उपयुक्त नाम माचुओ वाशो ठहरीयो । वाशो नाम रहनुको पछाडी एउटा रमाइलो प्रसँग जाडिएको छ ।

सन १६८१ तिर वाशोले एदो शहरमै आफू बस्ने छाप्रो नजिक केराको बोट लागए । तर कसै-कसैले केराको बोट मुन्त्रिरै छाप्रो बनाएर बसेको पनि भन्ने गरेका छन । जापानी भाषामा वाशो भन्नाले एक जातको केरा अर्थात केराको बोट भन्ने अर्थ आँठ्छ । वाशोलाई भेटन आउने आगन्तुकहरु एवं उनका चेलाहरुले उनको निवासलाई वासोधर वासोएन अर्थात केराधर भन्ने गर्दथे । यहि नामले व्यापकता पाउँदै गयो । सबैले चिन्दै सुन्दै र भन्दै गए । आखिरमा उनलाई माचुओ वाशो भन्न थालियो । माचुओ उनको थर हो भने वाशो उनको नाम हो ।

वाल्यकालदेखि नै वाशो प्रकृति प्रेमि थिए । विशेष गरि उनलाई केराको बोट मन पर्दथ्यो । त्यही भएरै होला सन १६८१ मा छाप्रो नजिकै केराको बोट रोपेका । भनिन्छ - केराकै बोट हेरेर उनले धेरै हाइकु लेखे । प्राकृतिक बिम्ब र प्रतीक फेला पारे र हाइकुमा रोमान्चक सदुपयोग गरे ।

वाशोको यात्रा जीवन

सन १६६६ मा तोदो योशिदाताको निधन भए पछीको वाशोको जीवन यात्रामा रुमलिन थाल्यो । उनले पटक पटक बसाइ सरे । पाठशाला खोल्ने क्रममा विभिन्न ठाँउमा पुगे । खास भन्नु पर्दा सन १६६६ पछीका अधिकांश समय वाशोले घुमफिरमा बिताए । तर वाशोले वास्तविक यात्राको आरम्भ भने १६८४ मा गरेका थिए । १६८३ मा आमाको निधन भएकोले आङ्गनी आमाको श्रद्धान्जली खातिर पनि उनि यात्रा गर्न निधोमा पुगेका हुन । शुरुमा उनि राजधानीबाट पश्चिम तर्फ लागे । जहाँ अध्यात्मिक ज्ञान लिए जेन गुरुहरुबाट । आध्यात्मिक ज्ञानलाई काव्यिक मालामा उन्ने काम पनि जारी राखे । एक महिने पश्चिम यात्रा पछि आङ्गनै जन्म थलो उएनो तर्फ लागे । जन्म थलो छोडेबाट अहिलेसम्म धेरै परिवर्न भैसकेका थिए । वाशो दंग परे । भौतिक परिवर्तन त छँदै थियो । साथमा उनका प्रशंसक र स्थानीय कविहरुको भेला गराए ।

केहि समय जन्मथलो बसाइ पछी वाशो नागोया तर्फ लागे । नागोया जाँदा उनले उएनो बाट केही कविहरुको टोली बनाएर लगेका थिए । टोलीको नेतृत्वमा रहँदा रहँदै फुयु नो हि को सृजना गरे । जुन सृजना पाँच खण्डमा विभक्त थियो । तगत्तै वाशो नारा पुगे । त्यसपछि ओगाकी र क्योटोको पनि रुचि पूर्वक भ्रमण गरे । र यस

सिजनको यात्रा सकेर एदो फर्किए ।

फेरी सन १६८७ मा काशिमा बाट यात्रा शुरु गरे । जुन शहर एदोको उत्तर पूर्वमा पर्छ । यसै यात्रासँग सम्बन्धित रहि काशिमा किको सिर्जना गरे । उत्तरी शहर काशिमाबाट उनि सिधै उएनो फर्किए । उएनोमा पनि थकाइ मारेनन वाशोले । यात्रा जारी गर्दै राख्दा सुमा र आकाशी तर्फ हानिए । यस चरणको यात्रा यिनले सारासिमा गएर विश्राम लिए । झण्डे १० महिना लामो यस यात्रामा दुइवटा महत्वपूर्ण पुस्तक लेखे । यात्राका क्रममा भेटिएका देखिएका सौन्दर्यता र भोग्नु परेका अवस्थालाई काव्यिक रंग दिन वाशो सफल भए । सारासिमा किको र ओइनोबोवुमि सन १६८८ यस बेलाका उपलब्धि हुन । यात्राबाट वाशोले धेरै कुराहरु सिक्न पाए र आफुले सिकेका कुराहरु चेलाहरुलाई सिकाए । उनी सन्तुष्ट बने यस यात्राबाट । यात्रालाई फलदायी ठाने । यात्रा गर्ने रहर सेलाएन । झन झन जाग्दै गयो । सारासिमासम्म यात्रा गरी एक वर्ष विश्राम लिएका वाशोले सन १६८९ मा पुन यात्रालाई निरन्तरता दिए । वसन्त ऋतुको आरम्भ सँगसँगै होन्शु तर्फ लागे । सेन्दाइ माचुसीमा हुँदै यशिनोमाकी

सम्म

पुगे

फेरी त्यहाँबाट पश्चिमतर्फ लागे । उनी किसागाता पनि पुगे । कानाजावा र निगाताको यात्रा गर्दै ओगाकी पुगेर आड्गनो यात्रा अभियानलाई विश्राम दिए । यो उनको अन्तिम चरणको यात्रा थियो । यसबेला झण्डे साढे पाँच महिनाको अवधि यात्रामा बिताए । दुरीको हिसाबमा चौबिस सय २४०० किलो मिटर भन्दा बढी यात्रा गरे । यात्राले वाशोलाई साच्चै नै वाशो बन्न ठूलो भूमिका खेलेको छ । यात्राको कारणले नै वाशो महान कवि बन्न सफल भए । यस अवधिमा नै यिनले ओकुनो होशो मिचि लेखे । ओकुनो होशो मिचि त जापानी साहित्यिक इतिहासमा नै एउटा उपलब्धि मुलक पुस्तक हो । जापानी विद्यालय तथा विश्व विद्यालयहरुमा वाशोको पुस्तक तथा उनका बारेमा कुनै न कुनै रूपमा पढाईन्छ । वाशो को हुन भन्ने कुरा प्रत्येक विद्यार्थीलाई चिनाइएको हुन्छ

सिकाइएको

हुन्छ

वाशोका यात्रापछिका दिनहरु पनि फलदायी साबित भए । लेखन कार्यलाई रोकेनन वाशोले । ओकुनो होशो मिचि १६८९ गेन्जुआन नोकि १६९० सामामिनो १६९१ सागानिकिक १६९१ उनका महत्वपूर्ण कृतिहरु निस्किए । सन १६९१ मा वाशो एदो फर्किए । त्यहाँ उनलाई चेला र प्रशंसकहरुको धुइरोले छोडेन । उनि साहैर व्यस्त भए । त्यस बेला त उनलाई सुसारे समेतको व्यवस्था गरिएको थियो । वाशोले सन १६९४ को वर्षा याममा क्युशुको यात्रा गर्ने उद्देश्यले घरबाट निस्किए । तर ओसाकामा पुग्दा पेट सम्बन्धी बिरामी परी २८ नोभेम्बरमा संसार छोडे । सन १६९४ मा यात्रा आरम्भ भए लगत्तै उनको देहान्त भएकोले सन १६८९ को यत्रालाई नै वाशोको जीवनको अन्तिम चरणको यात्रा भनिएको छ ।

वाशोको पुरानो ताल

वाशोद्वारा लिखित पुरानो ताल हाइकु अहिले विश्व प्रसिद्ध छ । कैर्यै भाषा र भाषिकाहरुमा समेत अनुवाद भइसकेका छन । एक पटक पढ्ने जो कोहीको पनि जन जिब्रोमा झुण्डिने खालको छ यो हाइकु ।

जापानी भाषामा

फुरु इके या
कावाजु तोबिकोमु
मिजुनो ओतो !

यस हाइकुलाई विभिन्न नेपाली साहित्यकारहरुले आ-आड्गनै ढंगबाट यसरी अनुवाद गर्छन ।

जीर्ण पोखरी

भ्यागुतोको छलाङ्घ
पानीको स्वर
--क्षेत्र प्रताप अधिकारी

पुरानो ताल
भ्यागुतो उपिरुदियो
पानीको शब्द
--स्व. शंकर लामीछाने
पुरानो पोखी
फुत्त छप्ल्याङ्घ
भ्यागुतो ।
-- डा. अभि सुबेदी

बुढो पोखरी
भ्यागुतो उपिरुदियो
जल आवाज
-- प्रा. राम कुमार पाँडे
पुरानो कुण्ड
भ्यागुता हाम्फाल्दछ
छालको छवनी
--गाविन्द गिरी 'प्रेरणा'
पुरानो ताल
भ्यागुतो उपिरुदिन्छ
पानीको स्वर
--प्रकाश पौडेल 'माइला'

यसै गरि हाइकुका महाकवि वाशोको अर्को हाइकुलाई निवन्धकार स्व. शंकर लामीछाने यसरी अनुवाद गर्नुहुन्छ ।

जापानी भाषामा -
सिजुकासा या (५)
इवानी सिमिइरु (७)
सेमी नो कोइ (५)

नेपाली भाषामा
कस्तो निस्तब्ध (५)
झटयाउँकिरीको शब्द (७)
तुब्छु तुङ्घामा (५)
(रुपरेखा २०२७ असोज अंक पेज ३०)

अन्तमा, आफ्नै रचना : हाइकु वासना

#कोइली चरी

निवास बिस्टैछ

बसन्त ऋतु ।

#छानो उडायो

बाह्रमास चल्ने यो

आँधि तुफान ।

#हावाको झोक्का

साकुराले फुरुरु

भुई रंगयायो ।

#यो चिप्लो बाटो

प्रेमिकाको प्रतीक्षा

पानी पर्दैछ ।

#हाँगामा बिस

फूल टिप्न खोजदामा

जवानी बित्यो ।

घामले पोल्दा

निद्राबाट व्यूङ्गिएँ

चरा उडैछन

आखिर मैले चाहेजस्तो किन हुँदैन ?

वेद प्र० काफ्ले

टोकियो, मार्च २००४

अहिले म बसिआएको ठाउँ जापान, जापानको पनि टोकियो हो। यो संसारका महँगो शहरहरूको सुचीमा हेर्ने हो भने पहिलो लाइनमै देखिने मध्येको एक शहर हो । यहाका नागरिकहरु स्वयंले त महँगो शहर भनि सहज स्वीकार गर्छन भने हामी नेपालीहरूले त यसलाई "महामहँगो शहर" भन्दा फरक नपर्ना । महँगी अनुसारको महँगै आम्दानी श्रोत पनि हुन सक्छ यदि तपाईँ काममा सरिक हुनुहुन्छ भने तर बिधार्थीको (जो छात्रवृति पाएर आएको छ) हकमा भने आम्दानीको श्रोत एउटा सानो छात्रवृति, अनि खर्च गर्नुपर्ने अनगिन्ती आबश्यकता आफैमा अलिक अप्ठ्यारो नै हुँदौ रहेछ। त्यसैले हामी पढाइको बिषयबस्तुको बारेमा कम तर आम्दानी-खर्चको लेखाजोखाको बारेमा अलि बढी घोलिने गर्दछौं। यो क्रम आजभोली मात्र देखिन थालेको होइन हामा अग्रजहरु बाटै धैरे अद्ययन-अनुसन्धान गरि निकालिएको निष्कर्ष हो । त्यसैले वहाँहरूले टोकियो शहर भित्र वा वरिपरिका बाहिरी ठाउँहरु के कति महँगा सस्ता छन् भन्ने विस्तृत विवरणको विश्लेषण पश्चात निचोड निकाल्नुभएको छ - हामी नेपालीहरु बस्नका लागि यी यी ठाउँ उपयुक्त छन् भनेर। मैले पनि वहाँहरूको त्यो अथक प्रयासबाट अविस्कार गरिएको दिग्दर्शनलाई पछाडै टोकियो शहरबाट रेलमा १:३० घण्टा लगाएर पुग्न सकिने "गाउँ" मा आफ्नो "घर" पारँ। घर रामो छ, घरभित्र बस्दा म प्रश्नन्न छु। तर जब म घरबाट बाहिर पाइला टेक्दछु, मैले चाहे जस्तो केहि पनि पाउँदिन।

बिहानै कलेज जानका लागि रेल चढ्न दौडै स्टेशन पुग्छु। मान्छे नै मान्छेले भरिएको रेल सरर मेरा सामु आउँछ। लाइन लागेर उभिएका सबै मान्छेको ताँतीमा हुइकिन्दै म पनि रेल भित्र पुग्दछु। जापानका मान्छे अलि बढि नै सहनशील हुदा रहेछन, भिंडमा वरपर बाट धक्का लगाउँदा पनि केहि भन्दैनन्। हाम्रो दक्षिण एसियाली मुलुकमा यसरी भिंडमा यात्रा गर्ने हो भने दिनदिनै कति बात, हात वा लात खाइसकिन्छ्यो होला। यस्तै सोच्दै म रेल भित्र उभिरहेको हुन्छु। रेल अगाडी बढै जान्छ र केहिबरमै अर्को स्टेशन आउँछ। झन् बढी मान्छे बाहिरबाट भित्र थपिन्छन्। भित्रका मान्छे चेपिन्दै जान्छन् तर पनि चुपचाप सहेर बसिरहन्छन्। यसरि अकस-मकसको यात्रा गरिरहँदा बेलाबेलामा देखिन्छ - विपरित दिशा तर्फ गइरहेको रेलका डब्बामा त २, ४ जना यात्रु मात्र छन्, आरामसँग निदाउन्दै यात्रा गरिरहेका छन्। म गम खान्छु - यता म चढेको रेलमा खुद्दा राख्ने ठाउँ छैन भने उता विपरित दिशा तर्फ जाने रेलमा ठाउँ छ तर खुद्दा छैनन्। यस्तै यस्तै गम्दै गर्दा मैले अद्ययन गर्ने थलो आइपुग्छ। दिनभरी अद्ययनतिरै भुलिन्छु। अनि रात परेपछि वासस्थान तिर फर्क्ने सुरसार गर्दछु। बिहान आउँदाखेरीका खाली रेलको झलझली याद आइरहेको हुन्छ। अब म तिनै खाली रेल चढेर घर फर्क्न्छु भन्ने कल्पना गर्दोगर्दै स्टेशनमा पुग्दछु। रेल सरर आउँछ, तर त्यो बिहान देखेजस्तो खाली हुँदैन। मान्छे नै मान्छेले खाचाखच भरिएर टम्म भएर आउँदछ। रेलको यात्रामा मेरो हाल बिहानको भन्दा कतै सुधार आउने लक्षण देखिन्दैन। कोचिन्दै भित्र पस्छु। च्यापिन्छु, पिसिन्छु तर पनि चुपचाप उभिरहन्छु। रेल अलिक अगाडी बढेपछि देख्दछु कि विपरित दिशाबाट गइरहेको रेल पुनः खाली नै छ। मलाइ कताकता रिस उठेर आउँदछ। किन म चढेको रेलमा मात्रै भिंड हुन्छ? किन मान्छेहरु सबै म जाता जान्छु तेतै जान्छन? कहिलेकाही त अलि पर पुगेर खाली रेल चढी पुनः स्कूलतिरै फर्किन मन लाग्दछ। तर फेरि मेरो त्यो सुन्दर घर पुग्न धैरै ढिला हुन्छ भन्ने सोची मन माथि जाँतो राखी चित्त बुझाउँदै भिंडलाई सहन्छु र खाली रेलको इर्ष्या नगरी भिंडमा च्यापिन्दै भएपनि उभिरहन्छु त गन्तव्यतिर लम्किरहन्छु ।

रेल पछिको हामीसँग सबैभन्दा सरोकार राख्ने ठाउँ डिपार्टमेन्टल स्टोर र त्यस भित्रको सामान कपडा हो । अति नै महँगो ठाउँ टोकियोमा भएका डिपार्टमेन्टल स्टोर सस्तो हुने त करै आएन। तर पनि बेलाबेला बिशेष गरि मौसमको परिवर्तन हुने समयमा "सेल" भनि ठुलाठुला तुलमा लेखी झुन्झ्याएको बाहिरबाटै देखिन्छ। म मख्ख पर्दै तिनै सेल अफर भित्र पस्दछु। गर्मी लाग्दैछ, एकदुई वटा पातला लुगा यो सेलको अवसर पारेर किनिहालीं भनेर सपना देख्दै। भित्र पसेर म फनफनी घुम्दछु - आफुलाई चाहिने सामान खोज्दै तर। पाउँछु मोठामोठा ज्याकेट अनि स्विटरमा मात्र छ छुट वा सेल। गर्मी मौसम सुरु हुँदैछ - चाहिएको छ पातला हलुका लुगा, तर छुट छ जाडोका बाकला लुगामा। नेपालीमा एउटा उखान छ - लग्न पछिको पोते के काम। पोते बरु लग्न पछि पनि भोलिपल्ट या पर्सिपल्ट जहिले लगाएपनि काम लाग्छ होला तर गर्मी सुरु हुने बेलामा जाडोका लुगा किनेर भोलिपर्सोपल्टै लगाउन क्यार! त्यसमाथि पनि अर्को जाडो शुरु हुनुभन्दा अगाडी नै तपाईँको नेपाल फिर्ती सवारी भयो भने ति लुगाले तपाईँको सामानको मात्रा बढाएर पिरको भारी बोकाउन के बेर। डिपार्टमेन्टल स्टोरले सेलमा सामान बेच्यो तर मेरा लागि "कागलाई बेल पाक्यो हर्ष न बिस्मात" भने झौं पुन नेपाली उखान सम्झन पुग्छु । म अब केपनि अनुमान लगाउन सक्ने भएभने जब जाडो सुरु हुनेछ तब यहाँ गर्मीका पातला लुगाहरूको सेल लाग्नेछ। तर त्यसबेला भने म नझुकिकउला किनकि अब म चनाखो भईसकै, अर्को पल्टको सेलमा म यहाँ आउँदै आउँदिन। यस्तै सोच्दै म हिस्स बुढी खिस्स दाँतको पारामा मलिन अनुहार पार्दै बाहिर निस्कन्छु।

रेल र डिपार्टमेन्टल स्टोरले मात्र होइन प्रकृतिले पनि मलाई चाहे जस्तो गर्दैन। विद्यार्थी जिवनमा परिक्षा धैरै आउँछन्, सीमित समयमा धैरै पढलेख गर्नुपर्ने हुन्छ। म यस्तै धैरै पढलेख गर्ने कल्पना गर्दै स्कूल आउँदछु। पढ्न थाल्दछु, समय पत्तै नपाइकन बित्त र रात पर्छ।

आफुलाई भने लामो दिन चाहिएको छ, एकैदिनमा धेरै पढ्नु परेको छ। तर दिनले भने मेरो मर्म बुझ्दैन र रातमा परिणत भइहाल्छ। म लुरुलुरु घर जान्छु। घर गयो दिनभरिको पढाइ र रेलको लामो यात्राले होला खुब मिठो निन्द्रा लाग्दछ। सुतेपछि एकैचोटी बिहान घडीले घण्टी ठोकेपछि मात्र बिँझिन्छु। कति चाँडो रात बितेको, कति चाँडो उज्यालो भएको? कति मिठो निन्द्रा लाग्दैहुन्छ तर रात सकिएर दिन चाँडै हुनाले सुन्ने धोको नै पुराहुन पाउँदैन। स्कूलमा पढदा जब मलाई दिन चाहिएको हुन्छ त्यसबेला रात पर्दछ भने घरमा मिठो निन्द्रामा सुतिरहेको बेला जब मलाई रात चाहिएको हुन्छ त्यसबेला दिन आइपुगदछ। प्रकृतिले पिरोलेको देश नेपालमा पानी नपरेर वालीनाली सबै सुकेर जानलाग्दा हामीहरु पानीको लागि भगवानको प्रार्थना गर्दछौं। प्रार्थनाबाट एकटुङ्ग भगवान मात्र खुशी भई ठीकक पानी वर्षाइदिए त रामै हुन्थ्यो तर हामा सबै भगवान खुशी भएर एकै पटक यतिधेरै पानी वर्षाइदिन्छन कि ठूलाठूला बाढीपहिरो आङ्ग त्यो सुकेको बाली हरियो नपारी बगाइसकेका हुन्छन। यसो बिचार गर्दा म लगायत हामी नेपाली यसरीपनि ठगिइरहेका छौं। तैपनि मलाई बुझ्न मन लागेको छ - आखिर मैले चाहे जस्तो किन हँदैन ?

(नौ वर्षपहिले लेखिएको यो लेखमा लेखकले आफ्नो विद्यार्थी जीवनको अनुभव व्यक्तगरेका छन्)

SUMMARY REPORT OF NESAJ ACTIVITIES (2012-13)**Nepalese Students Association in Japan****NESAJ****14th Executive Committee**

Nepalese students Association in Japan (NESAJ) has already completed its 15 years with the completion of our tenure in this month. We are really grateful to be a part of this most prestigious organization and thankful to all the members, well-wishers and supporting organization and people. We are continuously getting your support, guidance and encouragement during one year of our tenure. Despite the fact that handling such a huge organization in which members are spreading from very north to South of Japan is not an easy task, it is only due to your support and cooperation, we are going to successful completion of our tenure and at this moment, I hereby summarized of NESAJ Activities during this tenure on behalf of the present 14th Executive Committee.

We are organizing the three regular meetings which have decided some important task which become the guidelines for our one year tenures. I hereby like to include some pointed agenda and decision in our regular meeting:

- Formation of different sub-committee as Regional Coordinator and University Representative included many students to widen our discussion and activities.
- Formation of Web Committee for the website management and updates.
- Formation of NESAJ Patra Editorial Board
- Formation of Advisory Committee which include well-known and outstanding personality working in Japan.
- Decision for the publication of NESAJ Smarika: Formation of NESAJ Smarika Board.
- Formation of NESAJ Information Board in different region of Japan
- Decision for the major activities of NESAJ- NESAJ DAY Celebration, NESAJ Symposium, NESAJ Japanese Speech Contest program.
- Advertisement in NESAJ Homepage.
- Some Minor Modification in our letter pad.
- Celebration of Dashain and other Nepalese festival to promote Nepalese culture and traditions.
- Collection of monetary support for the treatment of Er. Roma Gurung.

Now I would like to briefly describe our activities as the guidance of our ex-com decision:

Collection of Monetary support for the treatment of Er. Roma Gurung

We have taken the initiation to support Er. Roma Gurung (Student in Korean University) who was suffering from very serious health problem. With the support from various personality in Japan we had collected JPY 78,500 and donate it to the Roma Gurung's Family. Now we believe that she had got better treatment and getting out from her health problem. We are thankful to all the personality who supports us in this act.

2) NESAJ 2nd Japanese Language Speech Contest

The NESAJ 2nd Japanese Language Speech Contest was successfully organized in Tokyo on 21st October 2012. This program was jointly organized with INCJ, Japan. The main aim of this program is to widen the horizon of NESAJ to all students in Japan. We are kindly supported by Nepalese Embassy Japan, Japan-Nepal Society, NRN Japan, IME Japan, BB Airways, and PBI Driving School for the successfully organize the program. (Included some photographs in photographs section)

3) The 8th NESAJ Symposium, 2013

The 8th NESAJ Symposium with the theme of "Knowledge Sharing for the Welfare of Nepal" was held in Nagoya on 13th January 2013. The program with the chief guest H. E. Dr. Madan Kumar Bhattarai, Ambassador, Embassy of Japan seems very successful with its aim. Some Nepalese Professors in Japan, Researchers, students and Japanese professors were attending the program and gives very nice talk. (Included some photographs in photographs section).

4) NESAJ Day 2013 Celebration

The NESAJ Day was organized in Fukuoka on 9th February, 2013. The program was chaired by president Er. Krishna Kumar Bhetwal. The huge participation of Nepalese students gives the sign of its success. The different Nepalese culture and traditions was showed in the program. The Fashion show, singing and Nepalese dance were the main attraction of the program. The problem faced by Nepalese students in Japan and the different scholarship program was also discussed. (Photographs in Photograph section)

5) Publication of NESAJ Patra Vol. 10

Publication of NESAJ Patra is at the end. The Publication committee is working for the finalization of the NESAJ Patra. We are schuduled to publish the NESAJ Partra Vol. 10 by the first week of April.

6) Publication of NESAJ Smarika

To give the great honor to the main personality who dreams for this organization and those who maintain the standard to this organization to bring it up at this stage and all the previous executive committee, the 14th Executive committee decided to publish NESAJ Smarika during its tenure. We have formed a Smarika Publication committee and works towards it. We have collected some materials and huge discussions were held. But unfortunately due to some technical problems, we are not succeeding to publish it. But we hope our materials and achievement will be good assets for coming executive committee to publish smarika of NESAJ.

7. Advertisement in NESAJ Homepage

The advertisement in our Homepage was continued in this tenure too. We get some advertisement which becomes a good source of income for this voluntary organization.

8. Co-Organizing a guidance Program in Fukuoka

We have co-organized a Fukuoka guidance program for the new comers in Japan on 22 July 2012 with FUNESO as organizer. The program was organized in Chyuou Simin Center Fukuoka which was successfully organized with about 40 participants in which we share the lifestyle and problems that we encounter in the early period of our Japan stay.

9. Actively Participation in the program Organized by other Nepalese Community/Society.

We attended many programs that were organized by the different Nepalese community and organizations in all over Japan. The ex-com members give their active participation in every program in which we are invited.

10. Financial support to the Sanu Maya Tamang's Family

Recently we get the shoking news of a student in Tokyo , Ms. Sanu Maya Tamang. We have collected some funds and give a small support of 50000 JPY to her family to bring her body to Nepal. We are thankful to all who share their helping hand in this regard. Special thanks goes to Dr. Ranjan Kumar Dahal, Bidur Gurung, Madhusudan Kayastha and Bipin Khanal.

Now I would like to mentions some committee for the successful completion of above task for their appreciation.

NESAJ Patra Editorial Board

Advisor: Dr. Achyut Sapkot

Advisor: Dr. Parveen K. Chetri

Editor in Chief: Mr. Suman Dahal

Coordinator: Mr. Justin Shrestha

Editors: Ms. Bhagwati Kunwar

Mr. Ajay Singh

Ms. Sharmila Nepal

NESAJ Symposium

Advisor: H.E. Dr. Madan Kumar Bhattarai

Chairman: Dr. Ved Prasad Kafle

Members: Mr. Rajan Bhattarai

Mr. Sandesh Pokhrel

Mr. RishiRam Parajuli

NESAJ Day Celebration

Advisor: Mr. Jiwak Raj Bajracharya

Advisor: Mr. Krishna Bhetwal

Coordinator: Mr. Ajay Singh

Members: Ms. Sharmila Nepal

Mr. Rishi Ram Parajuli

Mr. Pramod Poudel

NESAJ Japanese Language Speech Contest

Advisors: Mr. Jigyan Thapa
Mr. Arjun Adhikari
Mr. Bimal Adhikari
Mr. Krishna Bhetwal
Mr. Puskar Jung Thapa
Mr. Sandesh Pokhrel

Coordinator: Mr. Jiwak Raj Bajracharya

Member: Mr. Rajan Bhattarai

Mr. Krishna Kumar KC
Mr. Shyam Kumar Thapa
Mr. Rishi Ram Parajuli

Vote of Thanks

For the successful completion of the programs and activities we are very thankful to all our Advisors, coordinators, participant, organizations, personnel for their financial, moral and physical contributions. It is not possible to mention the name of all the personnel and organization to give them gratitude from our side. But still I would like to give the special thanks to the H.E. Dr. Madan Kumar Bhattarai, entire Embassy of Nepal Family, BB Airways, PBI Driving School, Bhawana International, Karuna International, Asuka International, Prakiti International, NRN Japan, INCJ Japan and all others.

Also I would like to mention the name and their donation amount for the treatment of Er. Roma Gurung:

Fund collected for Roma Gurung			
S.N.	Name	Amount Deposited (₹)	Remarks
1	Dilu Khatri	10,000	
2	M Khatri	5,000	
3	Rajendra Parajuli	3,000	
4	Youbraj Paudyal	3,000	
5	Bishnu Ghimire	3,000	
6	Saroj Kandel	2,000	
7	Sandesh Pokharel	2,000	
8	Ajay Singh	2,000	
9	Krishna Bhetwal	2000	
10	Rajan Bhattarai	2000	
11	Rishi ram Parajuli	2000	
12	R. Jung karki	2000	
13	Shyam Kumar Thapa	2000	
14	Mandira Thapa	2000	
15	Narayan Marasini	2000	
16	Sweata Sijapati	2000	
17	Jigyan Kumar Thapa	5000	
18	Bhupal Man Shrestha	3000	
19	Rajesh Sapkota	3000	
20	Krish K.C	2000	
21	Sharmila Nepal	2000	
22	Bhogendra Mishra	2000	
23	K. Thapa	5000	
24	Prakash Poudel (Maila)	2500	
25	Parash Mani Pokharel	2000	
26	Bimal Adhikari	2000	
27	Bhagawati Kunwar	4000	
Total amount		78,500	

Last but not the least, our sincere gratitude to all supporters and well-wishers of NESAJ, who has contributed a lot and played vital role for the successful completion of this tenure.

Thank you very much !

Rajan Bhattarai
Secretary
NESAJ 14th Ex-Com

Photo gallery

2nd NESAJ JAPANESE LANGUAGE CONTEST (21st October 2012)



NESAJ DAY CELEBRATION (9 February 2013)



8th NESAJ SYMPOSIUM PROGRAM (13th January 2013)



14th Executive committee



Krishna Kumar Bhetwal
President



Bhagawati Kunwar
Vice president
(Hokkaido)



Sandesh Pokhrel
Vice president
(Honshu)



Narayan Marasini
Vice president
(Shikoku)



Ajay Singh
Vice president
(Kyushu)



Rajan Bhattarai
Executive Secretary



Sharmila Nepal
Joint Secretary



Sweta Sijapati
Treasurer



Rishi Ram Parajuli
Member



Shyam Kumar Thapa
Member



Ramjung Karki
Member



Krishna Kumar KC
Member



Prerana Ranjit
Member



Mandira Thapa
Member



Pramod Poudel
Member