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CHAPTER 3

JUSTIFICATIONS AND COMPONENTS OF THE INTEGRATED ENVIRONMENTAL CONSERVATION PLAN

The Development Study on Environmental Conservation of Phewa Lake in Pokhara, Nepal

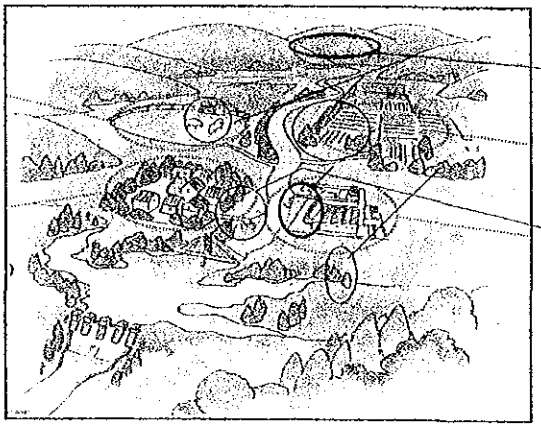
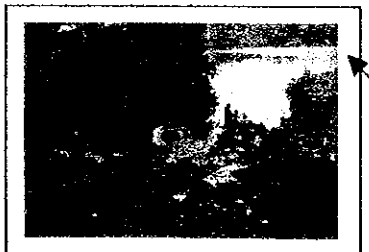
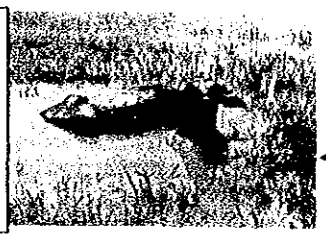
CHAPTER 3
JUSTIFICATIONS AND COMPONENTS OF THE INTEGRATED ENVIRONMENTAL CONSERVATION PLAN (MASTER PLAN)

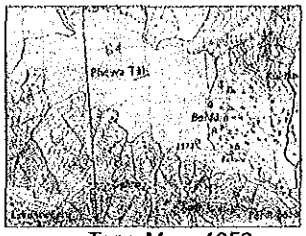
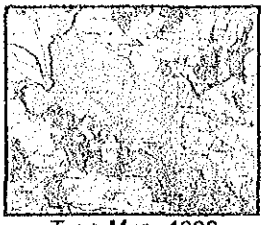
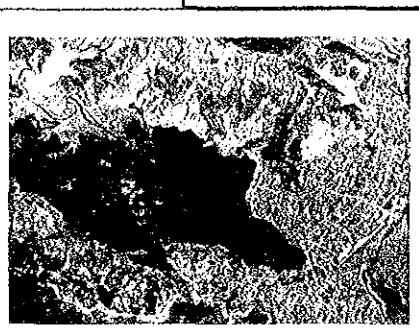
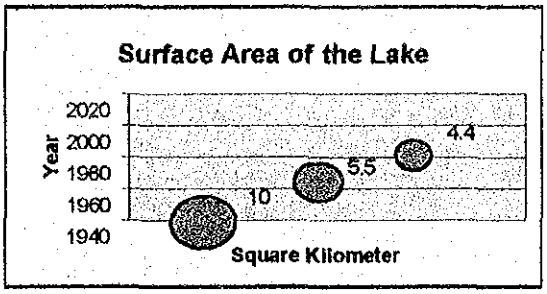
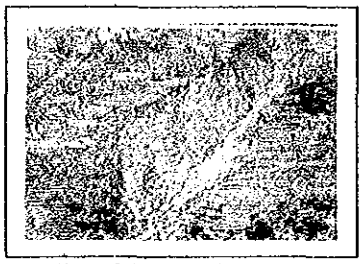
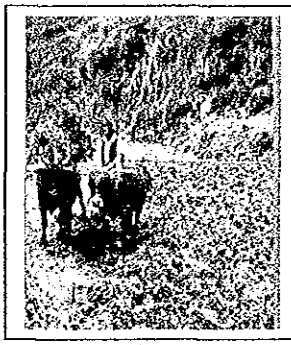
3.1 NECESSITY OF A MASTER PLAN

3.1.1 Necessity and Justifications of Master Plan

The existing condition of Phewa Lake is not satisfactory from environmental perspective, as the Lake and its watershed has been under immense and exhaustive pressure due to excessive human interventions since last couple of decades. This has resulted in various environmental problems, as presented in following **Table I-3.1.**

Table I-3.1: Environmental Status of Phewa Lake

What is happening (ISSUE)	Why it is happening (CAUSE)
▪ **Lake Water Quality Deterioration Making It Unfit for Recreational and Aesthetic Use.**    	▪ Discharge of domestic wastewater and sewer into the Lake through point sources (Phirke Khola, urban drain, Seti Canal etc.) ▪ Nutrients / fertilizers from agricultural fields (nonpoint sources) **Nonpoint Source**: influenced by precipitation, runoff during rainy season, eg. agriculture land, forest, urban area etc. **Point Source**: not influenced by precipitation, discharge all year round eg. houses, factories and domestic wastewater etc. ▪ Seepage and overflow of septage from septic tanks into the Lake ▪ Direct discharge of toilet wastes into the Lake by Lakeshore residents squatters.  ▪ Runoff carrying organic pollution load and solid wastes into the Lake  ▪ Laundry washing by hotels and residents (100 kg of soap per day goes into Lake water) ▪ Pollution from freely wallowing buffaloes and pigs at Lakeshore

What Is happening (ISSUE)	Why it Is happening (CAUSE)
▪ **Sedimentation of Lake** – 175,000 – 225,000 m^3 of sediment deposits in the Lake per Year (DSCWM, 1994) – Lake area shrinking at the rate of 2 ha. per year	▪ High sediment load from Harpan, Andheri, Sasurke Kholas (steams) and Seti Irrigation Canal (refer the photos)
 *Topo Map- 1959*  *Topo Map- 1998*	*Aerial Photo 1956*   *Aerial Photo 1996*
	
 Landslide,	▪ Landslide and soil erosion at watershed areas – deforestation for fuel wood, fodder, encroachment ▪ Inadequately developed infrastructures (eg. Baidam-Pame road) at Lake vicinity ▪ Soil Erosion – improper hill slope terrace cultivation – over grazing by cattle
 Baidam-Pame Road	 
▪ **Lack of Environmental Education** - people activating all sorts of environmental hazards innocently/ without concern.	▪ Lack of incentive for improving daily habits that are detrimental to the Lake. ▪ Lack of commitment and leadership ▪ Indifference of the rural people towards Lake conservation as they do not get any benefit from the Lake
▪ **Lack of Lake Focused Integrated Environmental Conservation Program**	▪ Lack of an active Lake focused institution and sustainable utilization of resources

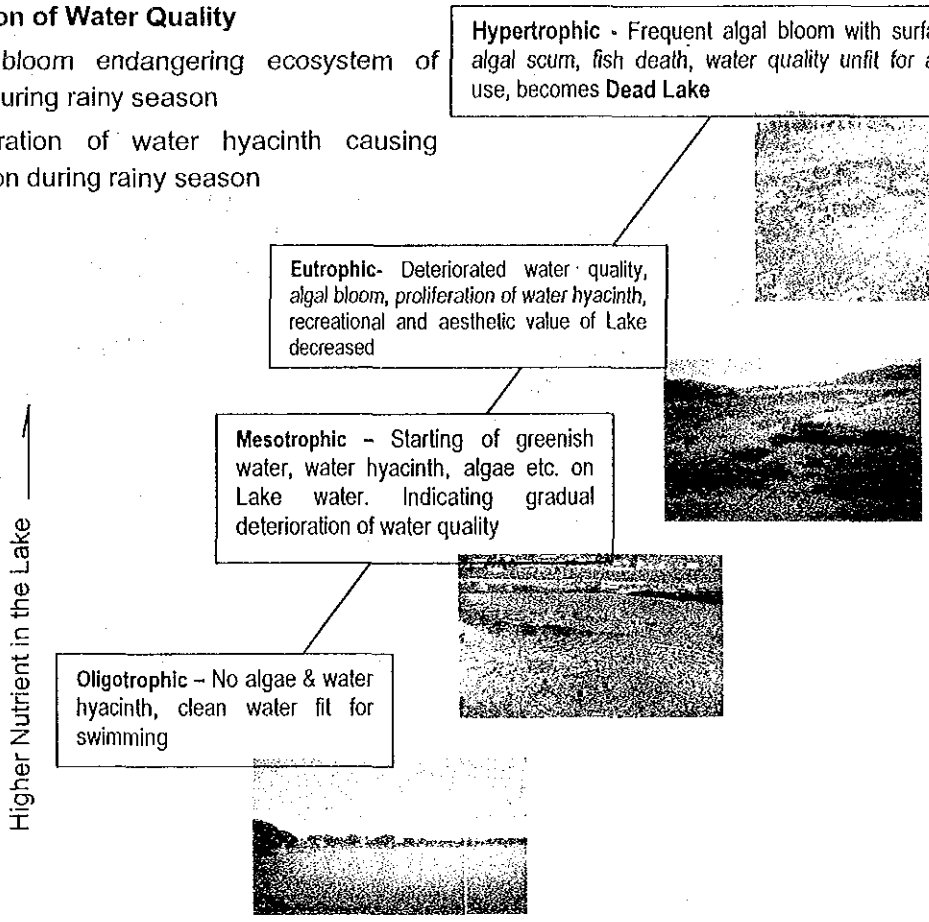
What is happening (ISSUE)	Why it is happening (CAUSE)
▪ **Lack of Resources to Undertake Such Program** ▪ **Lack of Rural – Urban Linkage for Collective Endeavor for Environmental Conservation of the Lake.**	▪ The HMGN supported Phewa Lake Area Conservation Committee does not have representation of beneficiaries hence more government dominated, and is grossly inactive. ▪ Benefits from the Lake not shared to rural community, which are equally responsible for its conservation.

The above issues and causes clearly presents various problems of much perplexity leading towards continual degradation of environmental health of the Phewa Lake. The pathetic state to which the Lake has reached due to these are presented below as 'Results'.

RESULT

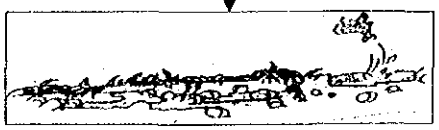
1. Deterioration of Water Quality

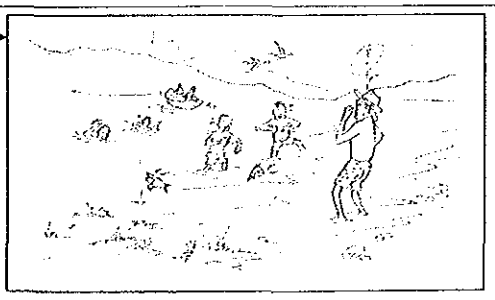
- Algal bloom endangering ecosystem of Lake during rainy season
- Proliferation of water hyacinth causing pollution during rainy season



Stages of Lake Water Quality Deterioration Due to Nutrient Input

- Skin and eye diseases due to swimming and bathing in polluted Lake water. Potential for outbreak of waterborne disease
- Foul odor due to noxious gas and mass fish death during summer





RESULT

The simulation study on major chemical parameters of Lake water during the Study also suggest gross decline of water quality below acceptable level with regard to international standards. The situation will further deteriorate if countermeasures are not implemented..

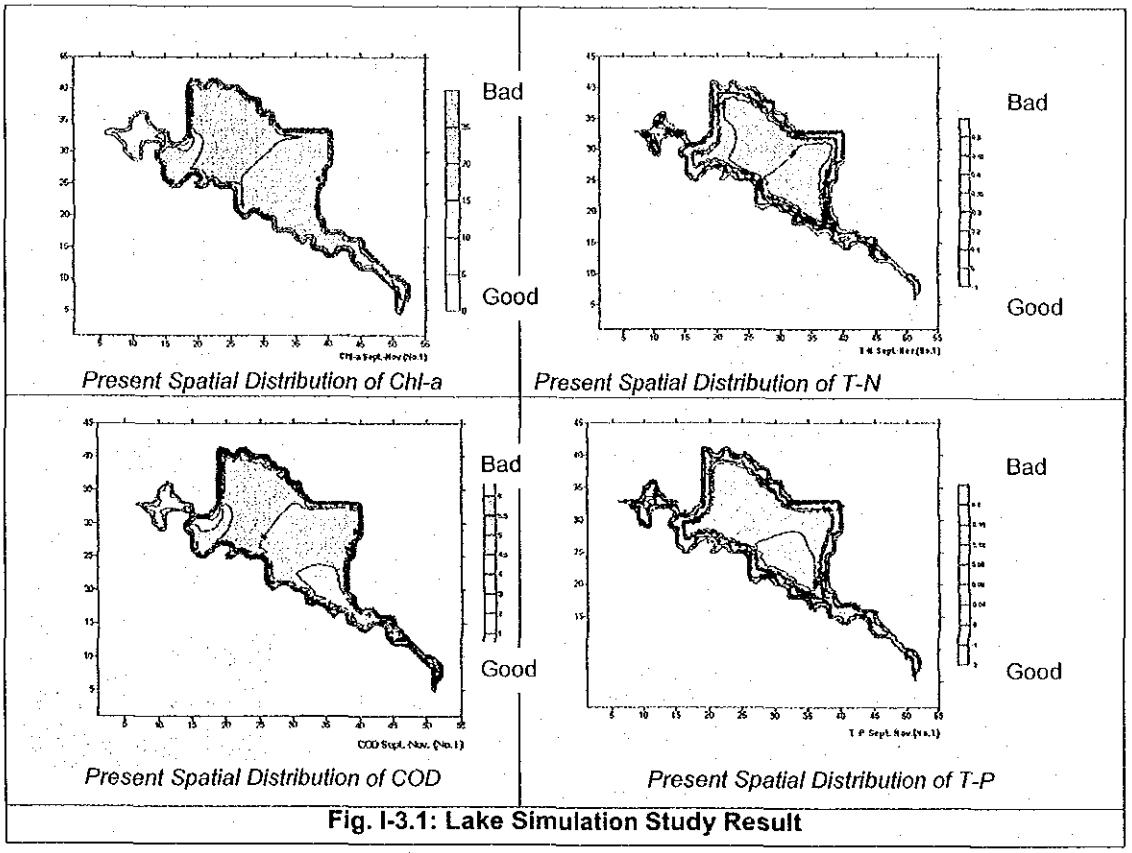


Fig. I-3.1: Lake Simulation Study Result

This condition of Phewa Lake can also be compared with other major Lakes of Japan and China. The comparison indicates that the status of total phosphorus (TP) and total nitrogen (TN), which are the key nutrients for eutrophication are above danger level inviting algal bloom in Phewa Lake (see **Fig. I-3.2**).

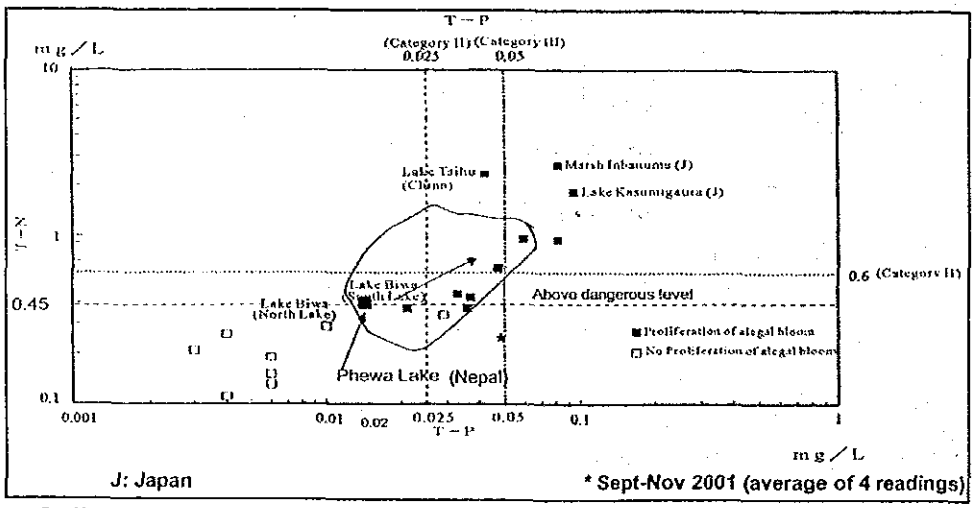
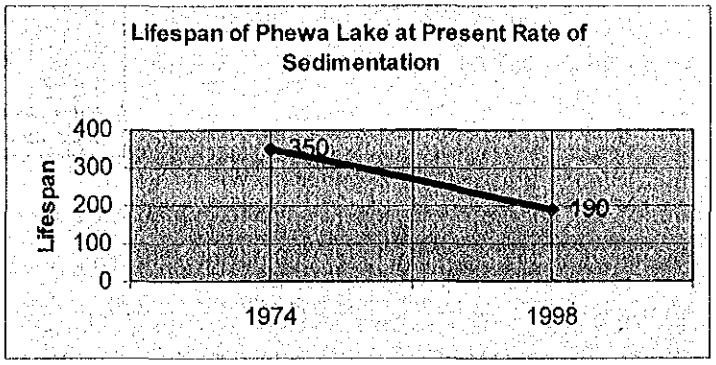


Fig. I-3.2: Pollution Status of Phewa Lake (Comparision of Some Major Lakes of Nepal, Japan and China)

RESULT

2. **Sedimentation of Lake**

80% volume of Lake will be filled up by sediment in next 190 years (Sthapit et.al., 1998)



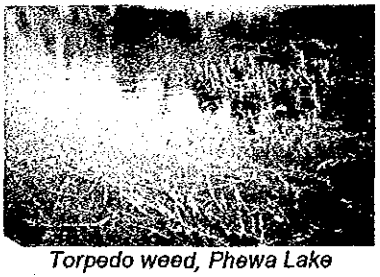
3.1.2 Proliferation of Environmental Problem in Phewa Lake if Countermeasures are Not Implemented

In absence of due implementation of relevant countermeasure, the environmental problems will get further deteriorated as discussed below. This will seriously curtail recreational and other socio-economic values of the Lake.

(1) Severe Deterioration of Lake Water Quality

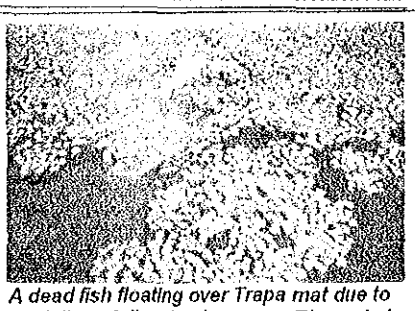
The household drains and storm-water drains from urban area of Pokhara Sub-metropolis are discharged into Phewa Lake either directly or through Phirke Khola, Seti Canal, and other urban drains. The runoff also brings with them solid waste increasing the organic pollution load in the Lake. The recently constructed storm-water drains are also connected illegally with household and sanitary waste. In such situation, the Lake will soon transform into a sewage pond. Such undesirable addition of organic nutrient in the Lake will worsen the already visible and experienced negative impacts as following:

- **Foul Smell and Fecal Bacterial Contamination:** Health hazardous bacteria from human and animal waste will increase in Lake water. Fecal coliform bacteria cause epidemic waterborne diseases such as typhoid, diarrhea, and dysentery. The foul smell experienced at some points at present will spread in future to other areas also.
- **Out Break of Waterborn Diseases:** Exposition of such fecal coliform will effect the quality of water, and make it susceptible to waterborne diseases like dysentery, skin rash and others if used directly or even indirectly.


Torpedo weed, Phewa Lake

Euthrophication and Algal Bloom: *Organic nutrients in* excessive amount will create favorable condition for excessive growth of vegetation like algae, water hyacinth, trapa mat, torpedo weeds etc. Such euthrophication in the Lake water can increase very fast and cover the

entire water surface of the Lake, and the Lake water will not be visible. The Phewa Lake has been experiencing such blanket growth of water hyacinth at some parts of the Lake, particularly since mid 1990. Unchecked euthrophication can in future grow to more serious hypertrophication and cause even murky (black coloured) water of the Lake.



A dead fish floating over Trapa mat due to depletion of dissolved oxygen, Phewa Lake

- ***Drastic Reduction in Transparency of the Water and Depletion of Dissolved Oxygen***: Excessive waste material in the Lake water will increase suspended material load and cause algal bloom, water hyacinth and others, that will decrease the transparency of the water as well as its dissolved oxygen content. Past record has indicated the rate of loss of transparency of the Lake water by 3% per year.

(2) Continual Shrinkage of the Lake

Sedimentation of the Lake has reduced its size to one third of what it was in late '50s. This rate may ultimately fill up the Lake within next two centuries. Decreasing size of the Lake will proportionately decrease its beauty, its consumer value, and the potential for income generation activity.

(3) Deterioration of Lake Ecosystem and Bio-diversity

Decline in water quality and size of the Lake will hamper the Lake eco-system and loss of its aquatic/wetland bio-diversity in and around it. This will turn it into a biologically '**Dead Lake**'.

Such deterioration in the water quality, size and ecosystem of the Lake will cause following:

- Decline in aesthetic beauty of the Lake
- Lake water quality become unfit for bathing, swimming, water sports
- Foul odor discourage people/tourist to visit the Lake
- Increase in rate of mortality of fishes and other aquatic animals
- Decline in income and employment from tourism and fishery development related activity dependent on Lake
- Decline in ecosystem health of the Lake and socio-cultural development of the area
- Urban decay at Lakeside area will initiate with decline in tourism industry

3.1.3 Factors of Obstruction in Environmental Sustenance of the Lake

Factors of obstruction to environmental sustenanace of Phewa Lake can be listed as follows:

(1) Lack of Sewerage System

Organic and fecal coliform contamination of the Lake, which is one of the main reason for Lake pollution can be substantially reduced by diverting urban drain, waste-water and sewage beyond the Lake through a sewerage system along the urban Lakeshore area. Such system do not exist at present.

(2) Lack of Sedimentation Control Measures

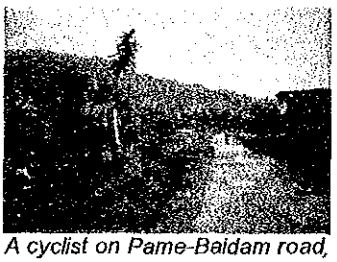
The Integrated Watershed Management Project in the early '90s have helped in decreasing soil erosion and landslide, and so the reduction of sediment inflow into the Lake. The absence of continuity to this effort and continuation of deforestation, traditional farming practice, improperly developed infrastructure services added with lack of environmental awareness has been triggering landslides and soil erosion, which is still a big factor of obstruction to control sedimentation of the Lake.

(3) Lack of Water Quality Management

The Lake is used freely for all purpose and no management system exists to maintain its quality. **'Do'** and **'Don't '** for the Lake has also not been practiced. Except the sanitation By-laws of PSMC, no comprehensive Lake water quality management system has ever been developed or implemented in it's watershed area. The existing By-laws, and other legal provisions prohibiting various environmentally degrading activities is virtually ineffective due to its weak supervision and control mechanisms. This is also an important factor of obstruction.

(4) Inadequate Water Quality Monitoring System

Inadequate water quality monitoring system and facility in Phewa Lake has posed constraint in evaluation of time series data on pollution load, discharge rate of point and nonpoint sources of pollution into Phewa Lake etc. This is an obstruction, which hinders in analysing root cause of pollution and develop check and balance mechanism necessary to conserve the water quality and healthy environment of the Lake.



A cyclist on Pame-Baidam road, which is full of pot holes

(5) **Poor Infrastructure (Community Road).** Absence on poor condition of community road in the rural area deprives good link between rural and urban area. Existing such roads e.g Khahare-Pame road is not environmentally sound and cause sedimentation of the Lake through soil erosion and landslides.

Absence of good road is also a constraint for better interaction, partnership and distribution of benefit between urban and rural areas.

(6) Weak Institutional Set up for Phewa Lake Environmental Conservation

Existing Phewa Lake Area Conservation Committee (PLACC), entrusted for conservation work of the Lake, is not active by virtue of lack of authority, resources and legal mandate to it. This committee is also not represented by all the stakeholders. It has not been able to produce any regular conservation plan and program for implementation. Similarly, Phewa Trust Fund is also not active. Various NGOs, although active at smaller scale is not very effective. The weakness of such organizations and lack of a single Lake focused umbrella organization for coordinating all the conservation activities is the biggest constraints for carrying out environmental conservation of the Lake.

(7) **Inadequate Management of Conservation Fund**

The existing conservation committee do not have any financial resources. Phewa Trust Fund has very limited fund of Rs. 750,000 in bank account and is working on the interest of this sum. The lack of financial source and sufficient fund is the major factor of obstruction which is impending the conservation of the Lake.

(8) **Inadequate Partnership Between Rural and Urban Community for the Conservation of the Lake**

Benefit of Phewa Lake has been basically enjoyed by the urban area and specifically people related to tourism trade. The Lake is also polluted mostly from the urban area. On the contrary, rural area is not benefiting from the Lake. Lack of such benefit has developed a 'not concerned' attitude of rural communities towards the Lake. Rural area in its place is the sole contributor to the sedimentation of the Lake. Thus, a close coordination between the rural and urban areas for undertaking Lake conservation activities is prime requisite. However, lack of coordinated interaction and participation between them, therefore, has been a factor of obstruction to the conservation of the Lake.

(9) **Inadequate Environmental Awareness/Education of the People**

There has been little or no sustained attempt to raise the consciousness to save the Lake through environmental awareness program. Community, although are concerned to the degrading environment of the Lake, do not have exact knowledge and education of those methods & practices that can help its conservation. Such awareness program is necessary for all age groups (school children, youths, adults) of the society.

Environmental awareness may be the best way to get support and sustain the conservation effort in the long run. As no such system exists, negligence due to lack of environmental awareness has been the factor of obstruction to the behavioral change for the benefit of the Lake.

(10) **Lack of Campaign on Environmental Conservation of the Lake**

Although the population of the watershed is very much concerned in conservation of Phewa Lake, the absence of knowledge to conserve it usually marginalize them in the effort. Lack of information and environmental promotional works also limit the Lake to get support from potential group of supporters. It also restricts the visitors and other on the generation of interest towards the Lake.

3.1.4 Analysis of Cause and Effect Relation

The escalation of environmental degradation if allowed to continue will not only destroy the Lake and rob its beauty, but will also negatively affect the ecosystem and biodiversity of the area. This, ultimately will be a big blow to the income generation by utilizing Lake-capital by the people and tourism industry of Pokhara.

Such impact from different aspect is discussed below and is shown in **Fig I-3.3.**

3.1.5 Needs of Inhabitants of the Phewa Lake Watershed

The objective, policy and content of the Study and need of an integrated Master Plan for environmental conservation of the Phewa Lake was presented to the beneficiary communities during the Public Hearing conducted at Pokhara on December 25, 2001. The public hearing was participated by the **Chairman, Kaski DDC; Mayor, PSMC; Member, Nepal Tourism Board; Chairman of the surrounding VDCs; President, HAN Pokhara Chapter; President, Pokhara Hoteliers Association; Chief, Tourism Office Pokhara/ HMGN; District Forest Office, HMGN; Soil Conservation Office, HMGN; Chief and Engineer, Pokhara Valley Town Development Committee, Pokhara; and representation from Private Sector, NGOs and CBOs like Mothers Group, Boater Association , Fishermen Association** and others.

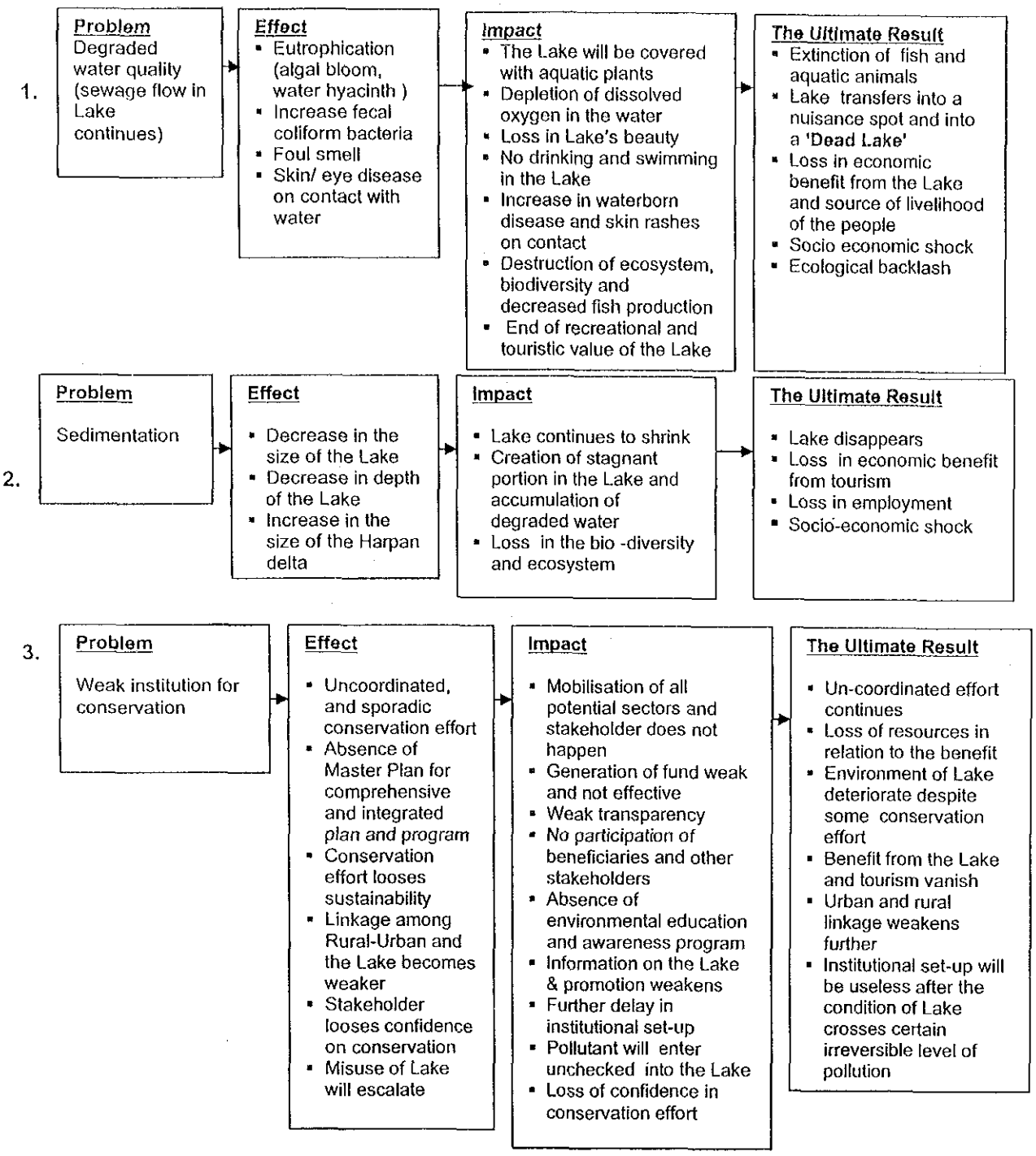


Fig. I-3.3: Cause Effect Relationship for Environmental Degradation of Phewa Lake

The critical comments and advise received from the public representing local authorities, HMGN agencies, NGOs, CBOs, Mothers Groups, general beneficiaries and intellectuals of Pokhara belonging to the urban and rural watershed area identified priority areas for environmental conservation of the Lake. The participation and comments de facto is the socio-political commitment and approval of the public for successful implementation of the Study. A summary of comments are presented below.

It was strongly recommended during the Public Hearing (**Table I-3.2**) that the Study should focus on long term proposal and should be implemented at the earliest.

Table I-3.2: List of Issues and Suggestion Made During Public Hearing, Dec, 25, 2001

S.N	Issues	Comments/Suggestion
1.	Water Quality Management and Sewage Treatment	▪ Every one is concerned on quality of Lake water ▪ Water hyacinth is decreasing aesthetic beauty of Lake ▪ Lake water stinks and also develop skin rashes when touched. ▪ Urban area through Phirke Khola, Seti Canal and laundry washing pollute the Lake. The storm-water drain constructed recently will further aggravate the situation as people have connected wastewater into the drain ▪ Based on the interaction, diversion of Phirke and other urban drains beyond the Lake is the most desirable and best alternate, although it does not coincide with the type of request of HMGN to GOJ for Grant Aid
2.	Watershed Management and Environmental Education	▪ Sedimentation of the Lake is the biggest problem, which has significantly decreased its size and volume ▪ Watershed management and environmental education is necessary and people are eager to participate ▪ River training of Harpan Khola is recommended
3.	Tourism Development	▪ The issues of negative impact on tourism due to the environmental degradation of the Lake is a concern for all ▪ Tourism should also be developed in the rural area as eco/village tourism ▪ Road to the rural area needs upgrading ▪ Attempt to lengthen the stay of tourist is necessary through improved infrastructure facilities
4.	Organisation/Institution	▪ An authorized and accountable committee for the conservation of the Lake is a must ▪ This committee should be well represented by beneficiaries rather than only HMGN agencies ▪ Member Secretary from HMGN is a good idea
5.	Phewa Lake Conservation Fund	▪ Such stable fund is necessary ▪ Most of the participants agreed and recommended to levy conservation fees from the tourists as sustainable source for the Fund ▪ Some prominent hoteliers expressed support if some tax for conservation of the Lake is also levied on local hotels, restaurants and business.

3.1.6 Need of Integrated Master Plan

The issues cause and result of environmental degradation of Phewa Lake and it's future state if countermeasures are not taken immediately, as well as the perception of present status of the Lake by its local beneficiaries/stakeholders and their need clearly emphasize an immediate planning and implementation of conservation works of the Lake. The various issues and causes leading to environmental degradation of Lake being of multidimensional nature, it obviously requires a complex and sectorally integrated prescription for its conservation.

Thus, to save Phewa Lake and its aesthetic value, and in the process proliferate and keep dynamism in the tourism industry that is dependent on the Lake, an integrated Master Plan is found to be very necessary for overall conservation of the Lake.

3.2 BASIC POLICY

3.2.1 Objective of the Master Plan

The objective of the Master Plan will be to

- save the Phewa Lake through implementation of integrated strategy, which will assist to reverse the present trend of deterioration of the Lake water quality and sedimentation, and restore the Lake back to its pristine condition;
- improve environmental condition of the Lake as well as its entire watershed area;
- attain urban-rural linkage for a collective effort for sustainable environmental conservation and lengthening life of the Phewa Lake, and in the process, share benefit generated out of the Lake-capital for increasing income generation opportunities and improving the quality of life of the people of both the areas; and
- launch environmental education and community empowerment and capacity building programs for generating awareness and commitment for environmental conservation of the Lake.

3.2.2 Basic Policy

- **Environmental Conservation through Integrated Approach:** The basic policy will include the formulation and implementation of a set of identified integrated and complimentary activities, which can be broadly grouped in to various components under a single Master Plan to check inflowing pollution load, restore Lake ecosystem and minimize rate of sedimentation in the Lake.
- **Rural – Urban Partnership Approach:** a sustainable and effective partnership should be realised between urban and rural areas within the watershed of Phewa Lake for generating collective effort towards saving the Lake and sharing of the economic benefit earned from the conservation of the Lake (mainly through improved tourism and income generation opportunities). Thus, to attain this goal, a **'Happy Cycle Model'** has been considered as the *basic policy framework* to design the components of the Master Plan. The framework of the model is presented in **Fig. I-3.4** in the following page.
- **Institutional Setup With Sufficient Authority:** There is a lack of a focused, responsible and legally supported autonomous institution and lack of resources to undertake activities for environmental conservation of the Lake. Thus, the basic policy will also include restrengthening/establishing such an institution and fund, and develop mechanism for generating sustainable financial sources for the fund.

3.2.3 Basic Concept Within Basic Policy

Formulation of a comprehensive Master Plan having an integrated, multi-pronged and strategic approach will be based on twin complementary components: *hardware component* and *software component.*

The *hardware component* includes technical intervention to attain certain physical target, whereas *software component* relates with community mobilisation through, awareness and community empowerment. **Fig. I-3.5** represents this basic concept within the basic policy adopted by this Study. The Study is a vehicle, which has hardware and software components as its two wheels, and successful environmental conservation of Phewa Lake as its integral body. An autonomous and Lake focussed institutional setup is its driver, which will drive the vehicle towards its target. The fund raised from utilizing economic value of the Lake will be its fuel. The benefit ripped from the Lake will be

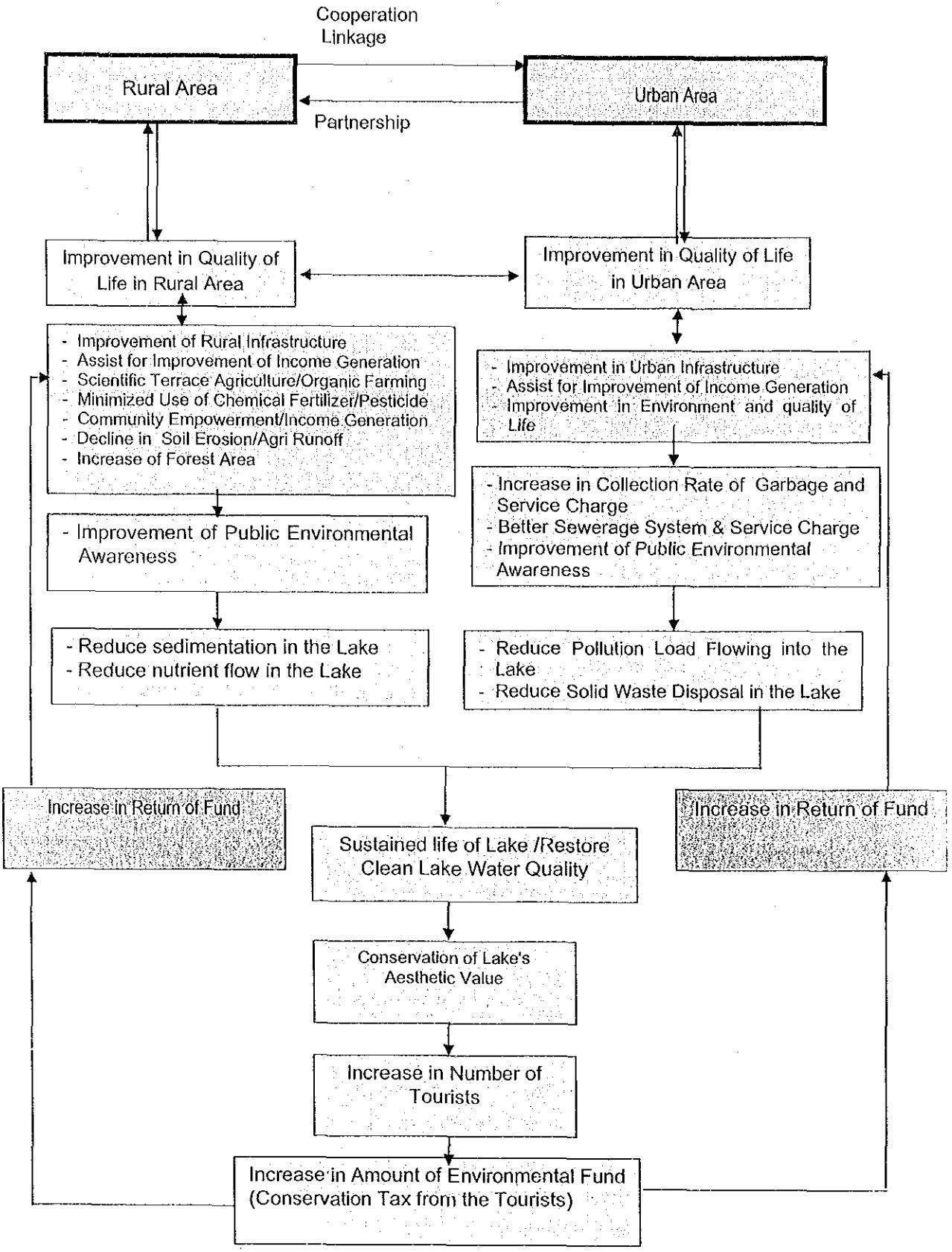


Fig. I-3.4: 'Happy Cycle Model' for Sustainable Conservation of Phewa Lake

the resource of fund, which will be shared by urban and rural watershed areas of the Lake for their developmental activities, which will have ultimate contribution for sustainable environmental conservation of the Lake.

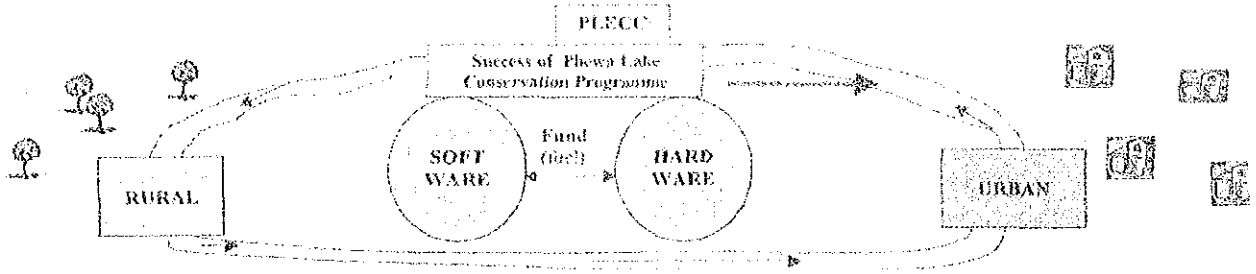


Fig. I-3.5: Graphical Presentation of Basic Concept Within Basic Policy of the Master Plan

3.3 COMPONENTS OF MASTER PLAN

3.3.1 Components

A **Master Plan** has been conceptualized, as presented in **Fig. I-3.6** in the following page. The figure explains that the core of the problems to be addressed is *(i)* Lake water quality management; *(ii)* watershed management. The water quality management can be addressed through Lake water purification system and controlling inflow of pollution load in the Lake. Sedimentation of the Lake, basically from the eroded watershed area needs to be addressed through a comprehensive watershed management plan. These two are the emergency need to conserve Phewa Lake. These can be achieved with long-term sustainable result only if the beneficiary community are educated, empowered and mobilized. When these are achieved, the ecosystem of the Lake will slowly regenerate itself back to its pristine condition, assisted by ecosystem management plan.

These activities needs to be implemented under one umbrella organizational setup, which is Lake focused, legally supported, and financially sustainable. Implementation of various plans also needs to be regularly monitored to ensure that their objectives are being achieved as desired through a well designed monitoring system. The ultimate success of such an integrated plan can be achieved only if the people of Lake watershed areas (both rural and urban) joins hand for saving the Lake. This needs optimum utilisation of social capital existing in the area, which will mobilize the community towards right direction.

With the above context, the **Master Plan** conceptualized by the Study includes nine plans under Hardware and Software components as presented in **Fig. I-3.7** below.

The program and projects (strategic actions) to be undertaken inside each of the components are presented in following **Table I-3.3**.

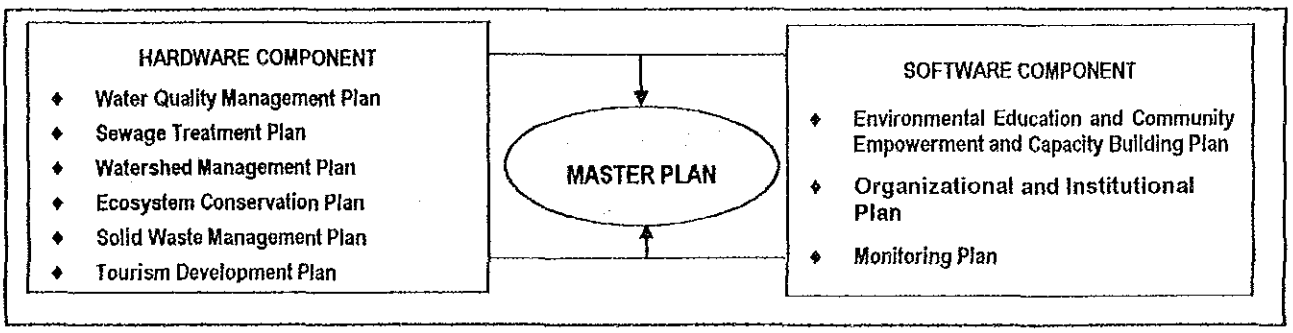


Fig. I-3.7: Proposed Master Plan and its Components

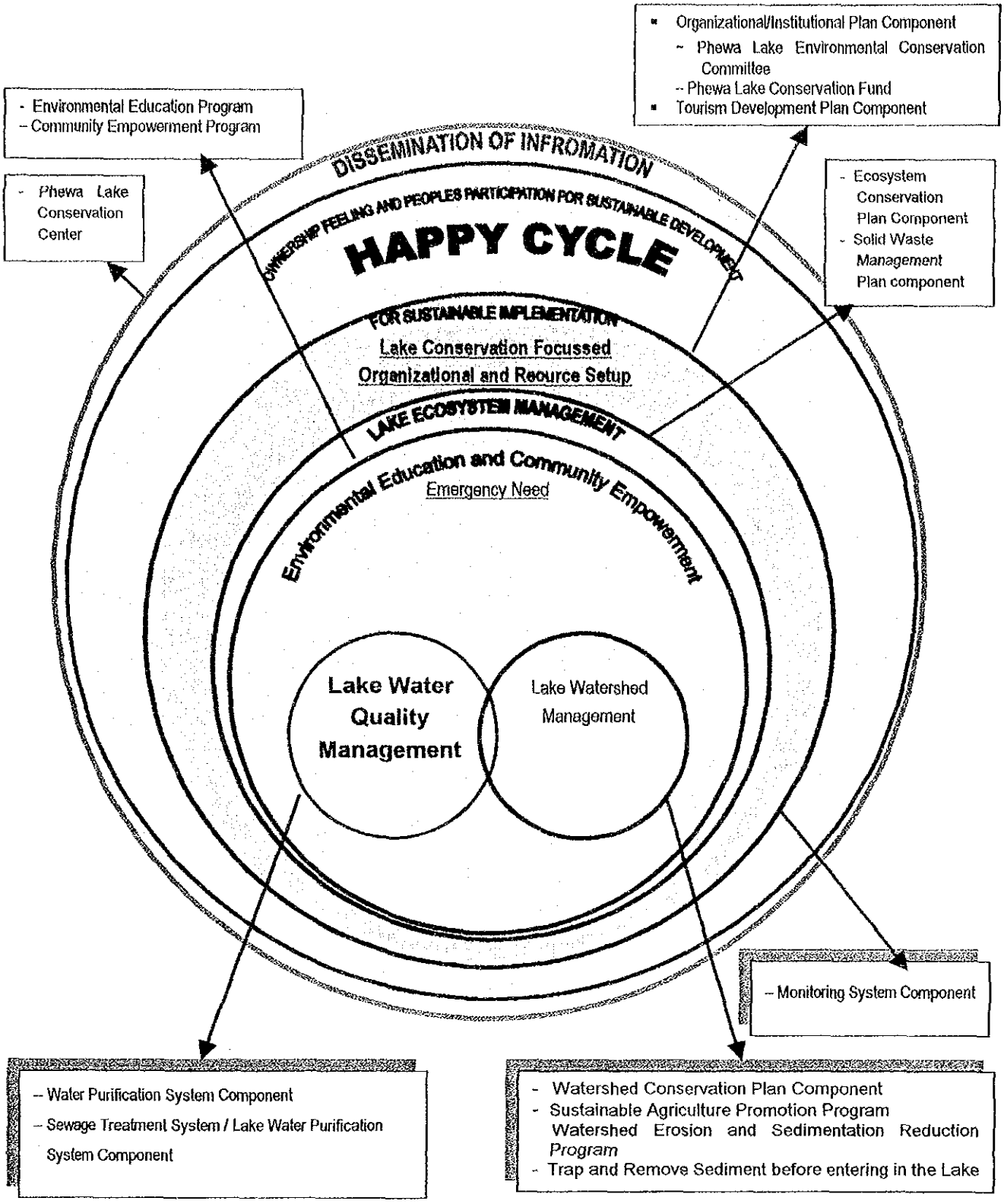


Fig. I-3.6: Integrated Environmental Conservation Plan for Phewa Lake

A combined figure presenting cause, result and countermeasures for integrated environmental conservation of Phewa Lake is presented in **Fig I-3.8**.

Fig. I-3.8: Cause, Result and Countermeasures for Integrated Environmental Conservation of Phewa Lake

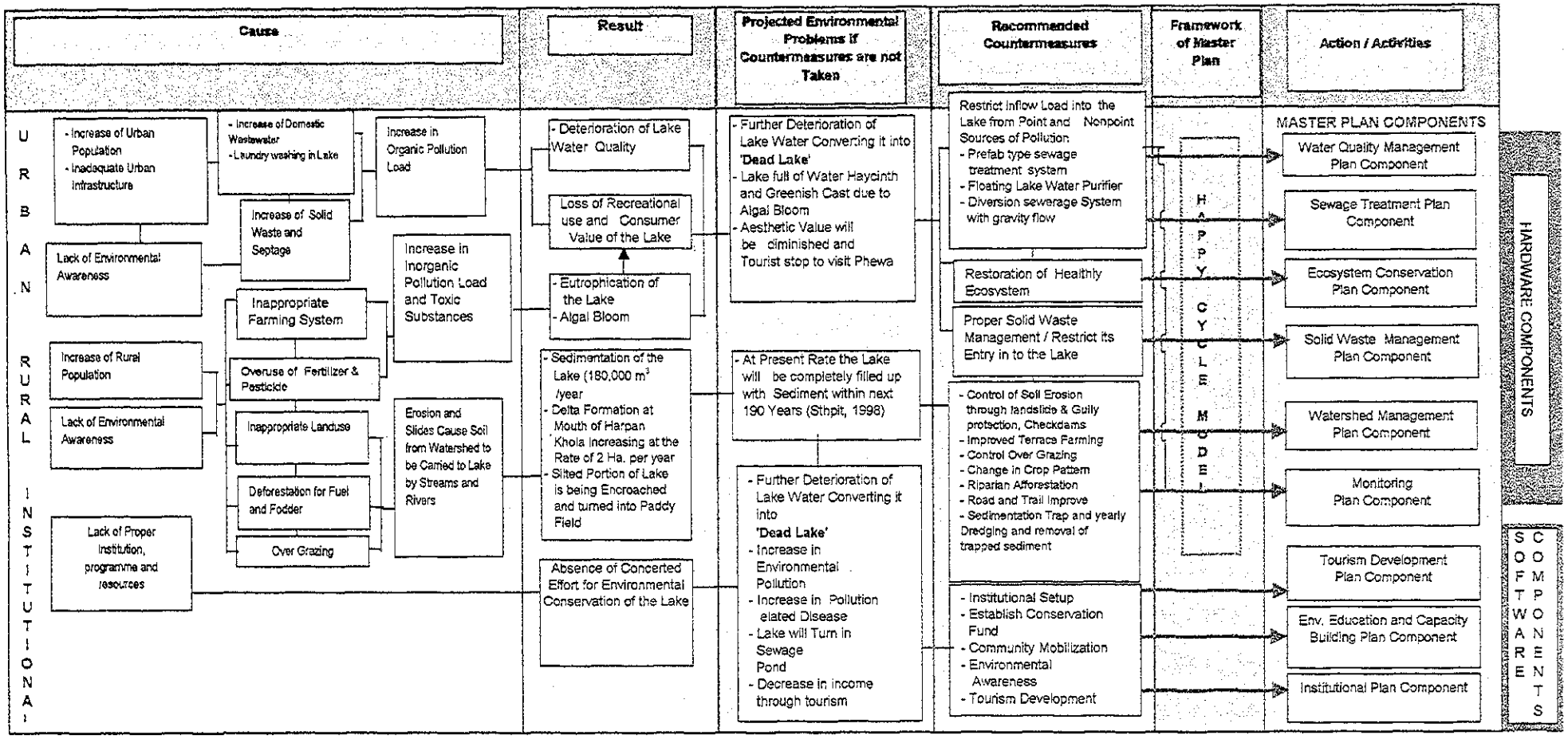


Table I-3.3: Components of the Master Plan

S. N.	Components	Programs	Project
1	Water Quality Management Plan	- Establishment of conservation targets, water quality standards, allowable inflow load, target reduction load etc. - Principles for the distribution of the target reduction load (selection of important areas and generation sources) - Selection and evaluation of load reduction measures - Applicable scale of load reduction measures	- Load reduction plan based on simulation study finding - Check entry of pollution load from point sources by construction of sewage treatment system - Check entry of nonpoint pollution load by construction of buffer strip around the Lake
2	Sewage Treatment Plan	- Domestic and commercial (hotel, restaurants etc) waste water and sewage treatment plan	- Diversion sewerage system
3	Watershed Management Plan	- Important areas for the implementation of the soil runoff prevention measures - Measures for environmental conservation oriented agriculture - Selection and evaluation of soil runoff prevention measures	- Sustainable agriculture promotion program - Agro forestry and reforestation - Silvi pasture - Water source protection - Watershed erosion and sedimentation reduction program Landslide treatment - Lakeshore buffer belt plantation - Stream bank erosion treatment - Road Improvement (drainage slope stabilization) - Dredging
4	Ecosystem Conservation Plan	- Measures for conservation of wetlands	- Eco land use planning and buffer zone in Lakeshore - Biodiversity protection and conservation of threatened species - Protection of wetland ecosystem
5	Solid Waste Management Plan	- Basic policy for domestic solid waste management plan in urban areas - Domestic solid waste management plan (basic concept) for rural watershed areas	- Solid waste management - Reduce-Recycle-Reuse - Environmental education and community mobilization
6	Monitoring Plan	- Specifications for Lake water quality monitoring - Specification for hydrological monitoring - Measures for watershed monitoring	- Lake water quality monitoring - Hydrological monitoring of inflowing streams - Watershed monitoring
7	Tourism Development Plan	- Policies for tourism development	- Promenade along lakeshore - Monitoring building By-laws - Phewa festival - Lakeside community road - Village tourism
8	Environmental Education and Community Empowerment and Capacity Building Plan	- Methods for implementation of environmental education program - Capacity building method to create human resources that can contribute to the effective management of environment	
9	Organizational and Institutional Plan	- Institutional system for implementation of Master Plan - Revitalize or establish institutional setup that is focused on Phewa Lake environmental conservation - Environmental information collection, management and utilization system	- Establish Phewa Lake Environment Conservation Committee - Establish Phewa Lake Environment Conservation Fund - Establish Phewa Lake Conservation Center

3.4 PRIORITIZATION OF COMPONENTS OF MASTER PLAN

The following **Table I-3.4** presents the interrelation of various components under the proposed Master Plan in matrix format. The table also presents priority components of the Master Plan that needs to be implemented immediately as a short-term emergency measure, which will give maximum effect within short period of time and can also produce long-term sustainable impact for conservation of the Lake. It is predicted by the Study that in the absence of quick implementation of such components, the Lake will experience most threatening and devastating environmental degradation, as it is undergoing at present, and will further deteriorate in future.

Table I-3.4: Rating of Selected Projects for Prioritization

Master Plan Components / Parameters	Hardware					Software		
	Sewage Treatment	Water-shed	Ecosys tem	Solid Waste	Tourism	Env. Edu	Inst. Setup	Monitoring
Environmental:								
Support Better Water Quality	10	8	6	6	4	8	8	8
Conserve Threatened Bio-Diversity/Habitat	8	8	10	6	4	8	6	8
Reduce Environmental Pollution	8	6	6	8	6	8	6	8
Ensure Long Term Sustainability	8	8	8	6	6	10	8	8
Technical:								
Cost Effective	5	2	2	3	4	5	4	3
Easy O&M	5	3	2	3	3	4	4	3
Technical Suitability	5	4	4	4	4	5	4	4
Ecosystem Support	5	4	5	4	4	5	4	4
Economic:								
Economic Return	4	4	3	3	4	4	3	3
More Targeted to Poorer People	4	4	3	3	4	5	4	3
Degree of Contribution For Increasing Number of Tourist	4	4	5	3	4	3	3	3
Suitability of O&M	4	4	3	3	3	4	5	3
Social:								
Number of Beneficiary	5	5	4	4	5	5	5	3
Degree of Request By Stakeholders	5	4	4	3	4	5	5	3
Easy to Implement/Low Resistance	4	4	3	3	3	3	4	3
Social Need /Emergency	5	5	3	4	4	5	5	3
Total	**93**	**76**	**71**	**66**	**69**	**87**	**78**	**70**
Ranking	**1**	**4**	**5**	**8**	**7**	**2**	**3**	**6**
Priority	**H**	**M**	**M**	**M**	**M**	**H**	**M**	**M**

Criteria of Rating: 1: Poor (<20%) 2:Fair (21-40%), 3=Moderate (41-60%), 4=Good (61-80%), 5=Excellent (>80%), **Maximum Mark:** 100

Level of Priority: ***High Priority*** (H): Excellent Level; ***Moderate Priority*** (M): Moderate to Good level

Ranking for prioritization of projects indicate that out of 8 selected projects, 2 and 6 numbers of project belong to high and moderately high priority category respectively. The first category projects included **Sewage Treatment Plan** in the first place followed by **Environmental Education Plan**; both scoring in the excellent range (80-100%) and verified as topmost priority projects. Componentwise, the former and latter belong to hardware and software components respectively. The **Institutional Strengthening Project** stood at first place in the second category and among the top 3 projects. The other 2 projects among top 5 projects included **Watershed Management Plan** and **Ecosystem Conservation Plan.** This was followed by **Monitoring Plan, Tourism Management Plan** and **Solid Waste Management Plan** successively. The **Water Quality Management** project has been excluded for rating as its major objective of restoration of water quality is met by sewage management aspect and monitoring aspect.

It is in this context; two of the components, namely **Sewage Treatment Plan** including wastewater treatment plan oriented for better Water Quality Management and **Environmental Education Plan** comprising community empowerment and capacity building have been studied in detail at Feasibility Level. They are also justified as they represent both hardware and software components. The former will address short-term goal and the latter the long-term goal. Their combination will be very effective. Other components are studied at Master Plan level. However, in each of the plan components, the prioritized activities are also identified and presented as Action Plan.

3.5 EXECUTING AGENCY

As discussed above, the executing agency of the Master Plans needs to be initiated and led by an umbrella committee exclusively mandated and focused on environmental conservation of Phewa Lake. The Committee should be composed of local development agencies (DDC, PSMC, VDCs), local community based organizations (NGOs, CBOs, mothers groups etc.) and related HMGN representatives. District Development Committee will chair the Committee.

3.6 TARGET AREA

The Master Plan will cover the entire urban and rural watershed area of the Lake. Out of different proposed plans, some specific plans are suitable for area confined problem, whereas some other plans have cross-cutting and interlinking nature. Following are the target areas involved with various Master Plans:

- **Target Area 1: Reservoir & Lakeside Zone:** Part of the touristically most important and densely populated urban area features high pollution load from point sources of pollution, eutrophic condition of water and solid waste disposal problem.

  This zone extends from Lakeside to Khapaundi area, mostly on northern side featuring level terraces and scattered village on Lakeshore; with meso-eutrophic water quality; holds importance for water recreation such as boating and swimming etc.

- **Target Area 2: Silt Trap Zone from Khapaundi-Pame:** This area feature mouth portion of Harpan Khola and its extensive wetland area; with mesotrophic water quality; hold importance for fishery /aquaculture development, habitat conservation of wild rice; access for village tourism; and soil erosion protection works to check sediment load into Phewa Lake.

- **Target Area 3: Rural Zone Lying in the Watershed of Harpan Khola eg, Kaskikot , Sarangkot, Dhikurpokhari, Chapakot, Bhadaure Tamagi and Pumdi Bhumdi VDCs:** This rural zone with the village area and threat of soil erosion / sedimentation is also one of potential target area. The Lake is surrounded by this zone and includes all the forest that hold high significance for ecosystem conservation; important areas for village tourism.

The above target areas having relation to the Master Plan Components is presented in following **Table I-3.5.**

Table I-3.5: Target Areas in relation to Master Plan Components

Target Area	Water Quality Management Plan	Sewage Treatment Plan	Solid Waste Management Plan	Watershed Management Plan	Ecosystem Conservation Plan	Tourism Development Plan	Environmental Education Plan	Monitoring Plan	Institutional Plan
1.	∇	∇	∇		∇	∇	∇	∇	∇
2.	∇			∇	∇	∇	∇		
3.	∇		∇	∇	∇	∇	∇		

Following **Table I-3.6** presents the target year and target level for each Master Plan components and also the modality of program implementation.

Table 1-3.6: Program Implementation

Component	Target Year	Target Level	Modality of Program Implementation
1. Water Quality Management Plan	Short term (3yrs.) 2007	Reduce the COD distribution in Lake to permissible standard	- Construction of diversion sewerage system - *Construction of laundry spots*
	Medium term (10yrs.) 2012	Reduce TN, TP distribution in Lake to permissible standard	Effective implementation of watershed management activities with wider peoples participation
	Long term (20yrs.) 2022	Understanding generation load per unit production	By cooperating with university, research institution and continued research by PLECC / Phewa Lake Conservation Center.
2. Sewage Treatment Plan	Short term (5yrs.) 2007	Reduce discharge of organic pollution load into Phewa Lake upto 25% of existing level	Installation of prefab type treatment system and lake water purifier or construction of diversion canal with gravity sewerage system
	Medium term (10yrs.) 2012	Reduce discharge of organic pollution load into Phewa Lake upto 50% of existing level	Replace HMGN requested grant aid type of treatment plants or maintain efficiency of diversion canal through periodic check / balance and establish tertiary level of WTP
	Long term (25yrs.) 2027	Reduce discharge of organic pollution load into Phewa Lake by >75% of existing level	Maintain efficiency of diversion canal and waste treatment plant through periodic check/ balance and repair/maintenance
3. Environmental Education and Community Empowerment Plan	Short term (5yrs.) 2007 Year I	• Raise environmental awareness and community empowerment programs to cover initial population at pilot scale of Phewa watershed area	• Ad-hoc institution set-up / committee formed • Participatory situation assessment done and project site community profile prepared • Participatory planning carried out and pilot test plan finalized • Materials and methodologies prepared and worked out • Environmental conservation systems worked out

Component	Target Year	Target Level	Modality of Program Implementation
		• Conduct environmental education and skill	• Interested NGOs, CBOs and women groups voluntarily participated and trained • Community charter agreement of environmental conservation initiatives in pilot area prepared
	Year II		• Pilot tests evaluated - pilot test experience/ findings/ learning disseminated • Materials and methodologies modified and improved as required - environmental conservation systems for Phewa Lake watershed and catchment areas worked out • Full fledge implementation plan prepared and implemented - Full fledge implementation arranged - 90% of all interested stakeholder organizations trained and prepared - 25% of the target population reached with
	Year III		• Target population reached with commitment-oriented education at 95% target level • Environmental conservation systems established
	Year IV		• Local community level conservation committees established • Permanent and sustainable institutions/ committees of Phewa Lake conservation established Environmental conservation systems implemented by the communities/ stakeholders
	Year V	Environmental education to 100 % targeted community	• Local community level conservation committees strengthened • Phewa Lake conservation institutions/ committees strengthened • Environmental conservation sustainable systems established and implemented
	Year VI		• Evaluation • Phase out arrangement
4. Institutional/ Organizational Management Plan	Short term (5yrs.) 2007	Establish a system of good governance on conservation and management activities of Phewa Lake; Effective planning, programming and implementation of developmental activities focussed on Phewa Lake conservation	Establish dynamic, well represented by local beneficiaries and goal-oriented committee; Establish Phewa Trust Fund; Undertake developmental activities geared towards environmental preservation of Phewa Lake; routine monitoring

Component	Target Year	Target Level	Modality of Program Implementation
	Medium term (10yrs.) 2012	continue.	continue
5. Watershed Management Plan	Short term (5yrs.) 2007	Rehabilitate erosion of Phewa watershed area and floodplain of Harpan Khola up to 25% reduction in the sediment load of existing level	Expedite soil and watershed conservation activity at existing/ potential landslide hazard area of Phewa watershed; riparian afforestation, protection of landslides, gully erosion, check dams, river control, improved terrace agriculture; forest management, infrastructure improvement, environmental education and capacity building
	Medium term (10yrs.) 2012	Attain same objectives at target of 50% high of existing level	Continue similar programs with periodic re-strengthening; environmental education; community capacity building at community level
	Long term (20yrs.) 2022	Attain same objectives at target of >75% high of existing level	Continue similar programs with periodic re-strengthening
6. Ecosystem Conservation Plan	Short term (5yrs.) 2007	Conserve and manage Lake shoreline area of Phewa Lake and Harpan Khola up to 25% of existing level	Expedite eco-zoning based land use planning, establish buffer zone along the northern shoreline of Phewa Lake and establish laundry spots at downstream area
	Medium term (10yrs.) 2012	Conserve and manage lake shoreline area of Phewa Lake and Harpan Khola up to 50% of existing level	Establish buffer zone along entire shoreline of Phewa Lake
	Long term (20yrs.) 2022	Conserve and manage lake shoreline area of Phewa Lake and Harpan Khola up to >75% of existing level	Promote mass scale practice of organic farming and integrated pest management discouraging use of chemical pesticides
7. Monitoring Plan	Short term (5yrs.) 2007	Ensure swimming water quality of Phewa Lake under international standard, as well as check growth of water hyacinth at open Lake waterscape and reduce potential of land slide hazard at the Phewa watershed area up to 25% less to the existing level	Establish monitoring system with management of adequate laboratory facility, manpower and funding support.
	Medium term (10yrs.) 2012	Attain same objectives at target of 50% high of existing level	Institutionalize an efficient monitoring system
8. Tourism Development Plan	Short term (5yrs.) 2007	100 % of the tourist visiting Pokhara will come to enjoy Phewa Lake and stay longer in its vicinity. 25 % of the visitors will also visit the rural areas and stay overnight.	Establish Phewa Lake Conservation Center (PLCC) and upgrade urban-rural linkage road linking Khahare-Pame-Thulakhet and Sarangkot-Naudanda in Phewa watershed area; village tourism; organize yearly theme-based Phewa Festival; International level water sports
	Medium term (10yrs.) 2012	All the VDCs of Phewa watershed will be able to accommodate tourists for two nights.	Institutionalize PLCC and carryout periodic repair/maintenance of linkage roads and other yearly programs
9. Solid Waste Management Plan	Short term (5yrs.) 2007	▪ 50 % coverage of urban Study Area for door–to-door segregated waste collection system.	▪ Establishment of efficient waste collection and transfer system; ▪ Street sweeping

Component	Target Year	Target Level	Modality of Program Implementation
	Year I	▪ 25 % coverage for street sweeping ▪ Initiation of waste management training at rural area	▪ Environmental education and community mobilization ▪ Pilot program at rural area
	Year II - III	▪ 90 % coverage of urban Study Area for door–to-door segregated waste collection system. ▪ 100 % coverage for street sweeping ▪ 75 % coverage for composting, briquette making, hand made paper, bio-gas at individual household level at rural area	▪ Institutionalization of waste collection ▪ waste purchasing and recycling facility ▪ strict monitoring and punishment / reward system ▪ extension of pilot program in rural area
	Year IV - V	▪ 100 % coverage of urban Study Area for door–to-door segregated waste collection system. ▪ 100 % coverage for composting, briquette making, hand made paper, bio-gas at individual household level at rural area	▪ Institutionalization of regulated waste collection and recycling facility ▪ extension of waste management program in rural area