

**Present Situation and Future Roadmap of
Energy, Water Resources and Irrigation Sector
(White Paper)**

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Background

The constitution of Nepal has implemented three levels of federal governance system including federal, province and local levels and managed to specify the list of activities to be carried out by all three levels on a regional basis as well. According to the task division manual-2074 of Nepal Government, the Ministry of Energy, Water Resources and Irrigation has been established by merging the then Ministry of Energy and the Ministry of Irrigation as well as the bodies under them along with the Alternative Energy Promotion Center and Department of Hydrology and Meteorology under the then Ministry of Environment.

The sustainable development, conservation and promotion of energy, water resources and irrigation as well as the specialization of activities in these fields in order to fulfill the slogan of the present government '*Prosperous Nepal, Happy Nepali*' is the current necessity. This white paper has been issued for the overall development of energy, water resources and irrigation by outlining the current reality of present situation, problems and challenges of the field and conducting object oriented analysis by establishing good governance in all sectors and supporting the strong resolution for fast development.

Objective

The objectives of this white paper including the present situation of energy, water resources and irrigation sector along with future roadmap are as follows:

- (a) To outline the real picture of the current situation, problems, reasons for not being able to achieve expected results and challenges in the field of energy, water resources and irrigation,
- (b) To formulate the future roadmap for this field according to the available resources, equipment and opportunities identified by conducting object oriented analysis of problems and challenges,
- (c) To prioritize activities so that maximum address is given to the increasing public expectation in the field of energy, water resources and irrigation by the use of available resources,
- (d) To fulfill the energy demand of the country and make sustainable, reliable, accessible, quality and clean energy available to all by increasing access to renewable and alternative energy along with electrical energy and determine a roadmap including energy security and energy independence,
- (e) To make year round and reliable irrigation facilities available for arable land by optimum utilization management of the available water resources in the country as well as to provide guidance on sustainable and effective management for reducing the water induced disaster,

(f) To formulate programmes in irrigation development to be independent in terms of food products by increasing agricultural production and productivity and make the slogan **'Enhancement of irrigated agricultural sector, prosperity for federal Nepal'** meaningful,

(g) To make weather and flood forecast more effective by providing quality statistics through establishing, expanding and modernizing water, climate and weather measuring centers.

(h) To make coordinated development with significant improvement in the overall service flow by routing direction of bodies involved in energy, water resources and irrigation sector.

(i) To effectively apply good governance and transparency in energy, water resources and irrigation sector.

Present Condition

(a) Water Resources

1. Our country Nepal; famous for water resources rich country, is estimated to have rivers with average annual run-off of almost 225 billion cubic meter. Rechargeable groundwater is estimated to be between 5.8 and 11.5 billion cubic meter. Out of available water resources, estimated usage in irrigation is 28.8 billion cubic meter, in industry is 0.5 billion cubic meter and in service sector is 0.01 billion cubic meter. Currently, Nepal's water-use efficiency is estimated to be 0.6 USD per cubic meter. This shows that the use of water is economically and socially low.
2. For integrated development of water resources, Water Resources Act, 2049 is being applied and Water Resources strategy, 2002 and National Water Scheme, 2005 are also in action.

(b) Energy

3. Nepal's electricity development journey started from 500 KW Pharping hydropower station in Jestha 9, 1968 B.S. (22 May, 1911 A.D.). Till now, 1073 MW capacity schemes (1016 MW from hydropower, 54 MW from diesel/multifuel and 2.68 MW from solar energy) are involved in central electricity grid system.
4. Nepalese constitution has managed policy to promote multipurpose utilization of water resources by prioritizing indigenous investment based on public participation. Energy sector has also been getting high priority in Nepal's previous periodic plans. With the help of government, private, community and international investment, there have been efforts in hydropower sector's development and promotion.

5. The highest level of management in demand and supply of electricity for the past one year has achieved significant success in reducing loadshedding. There have been additional improvement efforts being done for regular power supply in the coming years. The completion of the construction of essential infrastructures including under construction projects related to electricity generation, transmission and distribution line projects is being made in order to fulfill the growing demand of electricity required for the modernization and industrialization of the country

Electricity Generation

6. Out of the current installed capacity of electricity generation of 1073 MW, 562 MW is from NEA and the rest 511 MW is from private sectors. The maximum demand in the national electricity system is about 1300 MW. In addition to the domestic generation, 450 MW is being imported from India for fulfilling the current demand and demand management.

Transmission System

7. The capacity of existing and under construction transmission line and substations around the country having a voltage level of 66 K.V. or higher are as follows:

Existing 1 unit 400 KV transmission line	78 circuit k.m.
Existing 1 unit 220 KV transmission line	75 circuit k.m.
Under construction 8 units 220 KV transmission line	1357 circuit k.m.
Existing 30 units 132 KV transmission line	2819 circuit k.m.
Under construction 15 units 132 KV transmission line	1108 circuit k.m.
Existing 15 units 66 KV transmission line	494 circuit k.m.
Existing 18 units 132/33 KV substation	1996 M.V.A.
Existing 7 units 66 KV substation	621 M.V.A.
Under construction 7 units 132/33 KV substation	533 M.V.A.
Under construction 1 unit 220/132 KV substation	230 M.V.A.

Distribution System and Consumer Service

8. Nepal Electricity Authority has provided electricity service in 76 districts (electricity distributed by local private electricity company in Solukhumbu) of country in present condition. By the end of Falgun 2074 BS(March 15, the consumer number has reached 3,465,822. Electricity consumption of Residential consumers which is 94% of total consumers is 41.85%, Industrial consumers which is 1.4% of total consumers is 35.61% and other consumers which is 4.6% of total consumers is 22.54%.
9. Other than Nepal Electricity Authority, 281 local community organizations are providing services to almost 500 thousand consumers. In addition, electricity services are being provided to almost 50 thousand consumers by Butwal Power Company in Syangja, Palpa, Arghakhanchi and Pyuthan districts.
10. Under Nepal Electricity Authority, 103 distribution centers within 8 regional offices are providing Consumer service with work also being done in electrification and distribution system expansion. Rural Electrification is being done with 33/11 KV substation and 33 KV, 11 KV and 0.4/0.22 KV distribution line. Distribution system under different regional offices is as shown below:

Regional Office	33/11 KV Substation (KVA)	33 KV Line (km)	11 KV Line (km)	0.4 and 0.22 KV Line (km)
Biratnagar	248.5	623	4929	14001
Janakpur	121.1	658	4132	10891
Kathmandu	215.8	309	5058	24459
Hetauda	110.6	258	3160	8529
Pokhara	80.5	663	2794	9694
Butwal	159.6	733	3318	9967
Nepalgunj	120.7	635	2531	12264
Attariya	78.5	501	3741	11731
Total	1,135	4,381	29,664	101,531

11. The transmission lines of 33 KV, 132 KV and 400 KV levels used to import electricity from India and their transmission capacity are as follows:

Transmission Line	Voltage Level (KV)	Import Capacity (MW)
Kataiya-Rajbiraj	33	10
Sitamadi-Jaleswor	33	12
Kataiya-Inaruwa	33	5
Rakswol-Birgunj	33	12
Jayanagar-Siraha	33	7
Naanpara-Nepalgunj	33	12
Kataiya-Kusaha	132	125
Ramnagar-Gandak	132	25
Tanakpur-Mahendranagar	132	32
Mujafarpur-Dhalkewar (400 KV)	Currently charged at 132 KV	145
Kataiy-Kusaha (new)	132	50
Rakswol-Parwanipur (new)	132	50
Total		488

State of Licence

12. Currently, there are 172 projects with total capacity of 4642 MW in different stages of construction after having issued electricity generation licence. For additional 36 projects totaling 3466 MW capacity after completion of the study, action is being taken on the promoters' applications for electricity generation licence.
13. The permission of electricity generation has been issued to the promoters of 302 projects of total 15,887 MW capacities and which are in different stages of study. Similarly, survey licence for 100 electricity transmission lines and construction licence for 96 transmission lines have been issued.

Power Purchase Agreement (PPA)

14. At the end of 2074, Power Purchase Agreement has been completed between private electricity producing companies and Nepal Electricity Authority for 244 projects with total installed capacity of 4138 MW. Among this, business production from 73 projects with total installed capacity of 511 MW has started and already connected with national electricity grid system. Construction of 104 projects with installed capacity of 2323 MW has started with financial

arrangement already completed. 57 projects with installed capacity of 1303 MW are in different stages of construction.

(c) Alternative Energy

15. With the plan of developing and expanding renewable energy technologies, Nepal Government established Alternative Energy Promotion Centre (AEPC) under Alternative Energy Promotion Development Committee according to Development Board Act, 2013 (1956) on Kartik 18, 2013 (November 3, 1996). After establishment of which, through promotion of renewable energy technologies, efforts to bring improvement in lifestyle of people of rural areas, conserve environment, increase employment opportunities and by commercialization of renewable energy technologies, developing industries related to it has been done.
16. Different programmes by Alternative Energy Promotion Centre (AEPC) focusing on work for management, development, utilization and expansion of mini and micro hydropower, solar energy, organic energy (biogas, improved cooking stove, bio-briquette, gasifier, etc.), wind energy, improved water mill, geothermal energy, etc. are being conducted. Through this effort, people of rural areas, where there is no provision of electricity service from national electricity system have been given electricity from mini and micro hydropower, solar and wind energy with expansion in reach of electricity. Also, biogas, improved cooking stove, bio briquette, gasifier, etc. mediums have helped in reducing environmental pollution and in efficient use of energy in rural areas.
17. Till now, more than 3.6 million households have benefited from more than 55 MW electricity produced from renewable energy sources. From the mini and micro hydropower and solar energy, electricity has reached to almost 18% of people in nation with almost 30 thousand employment opportunities being created.
18. With 8 carbon projects related to renewable energy registered in United Nations Framework Convention on Climate Change (UNFCCC) and 1.8 million tons Certified Emission Reduction (CER), almost 1 million rupees has been earned from carbon trading.
19. The total contribution of renewable energy out of the total generated energy in the country is 3.5 percent.
20. Among various renewable energy technologies, 400,432 domestic biogas plants, 88 large-scale biogas plants, 1,343,242 improved clay stoves, 794,276 household solar systems, 10,654 improved water mills, 1,701 institutional solar electricity systems and 41,090 improved steel stoves have been installed through Alternative Energy Promotion Center until now. Electricity equal to 29,457 kW from micro and mini hydropower projects and 413 kW from wind and solar

mini grid system has been generated. Apart from that, through the use of the renewable energy, more than 2000 small and medium scale industries have been established that has helped in making the evolution of the economy.

21. Since the capability of the public living in the rural areas to install renewable energy technology is limited, renewable energy subsidy policy and operational procedure has been implemented to install technology in and provide grant for such households.
22. In the context of Alternative Energy Promotion Center contributing in reducing climate change and carbon emission along with environment conservation, as the center has been selected by the Government of Nepal, Ministry of Finance for accreditation as Direct Access Entity of Green Climate Fund (GCF), the center has submitted a proposal to GCF and has entered the second stage after completing the evaluation of first stage.

(d) Irrigation and Water Induced Disaster Management

23. Out of the total 14,718,100 hectare area of the country, total cultivable land area is 2,641,000 hectare out of which irrigable land area is only 1,766,000 hectare. Irrigation facilities have been built and irrigation service has been provided to 1,433,287 hectare land. Out of the total irrigated area, underground irrigation accounts for 443,365 hectare, farmer managed irrigation system accounts for 167,925 hectare and surface irrigation accounts for 813,067 hectare area. Only one third of the total irrigated area in Nepal receives year round irrigation facility.
24. In the context of most Nepalese public still considering agriculture as the main basis for livelihood, the investment done by the nation in irrigation has not been enough. Looking at the scenario of last ten years, although there has been a slight increase in budget for irrigation annually, it has not been able to address the real demand.
25. Different projects of national pride are being operated in irrigation sector. Sikta Irrigation Project to provide irrigation service by constructing barrage in Rapti river in 42,766 hectare land of Banke district, Rani Jamara Kulariya Irrigation Project to increase agricultural production by providing irrigation service over the year in 38,300 hectare land of Kailali district, Babai Irrigation Engineering Project to increase agricultural production by providing irrigation service over the year in 36,000 hectare land of Bardiya district and Bheri Babai Diversion Multipurpose Project (BBDMP) to provide irrigation service over the year in additional 15,000 hectare land of Banke and Bardiya district totaling 51,000 hectare land (48 MW electricity also to be produced by dropping 40 m³/s water from Bheri river in Babai river) are in construction phase.
26. Sunsari-Morang Irrigation Project to provide irrigation service in 68,000 hectare land of Morang and Sunsari district, Bagmati Irrigation Project (with Sunkoshi-Marin Diversion Project) to provide irrigation service in 122,000 hectare land capacity of Sarlahi, Rautahat, Bara, Dhanusha and Mahottari district and Mahakali Irrigation Project (Phase Three) in construction to provide

reliable irrigation service in 33,520 hectare land of Kailali and Kanchanpur district, Great Dang Valley Irrigation Project to provide irrigation service in 56,000 hectare land of Dang district and Palungtar Kundutar Irrigation Project to provide irrigation service in 2,000 hectare land of Gorkha district are in construction and development phase.

27. As per Irrigation policy, for the purpose of developing irrigation projects in 100 to 2,000 hectare land of Terai and 10 to 500 hectare land of Hilly region, mid-level irrigation programmes are being operated from the fiscal year 2061/62 with construction and rehabilitation of schemes. From this programme, 445 projects have been completed with systematic and reliable irrigation service provided in 58,403 hectare land.
28. Irrigation programme based on new technology operated with the goal of use of small sewage water, rain harvesting and the marginalization of river water by lifting (solar and biotech), increase revenue earnings of backward farmers through crop (vegetable, fruitful, herbal) cultivation in small hills and even tar have been available in 5810 hectares of land by completing 436 projects till date.
29. There are special projects related to irrigation running in 22 districts from Prosperous Terai-Madhesh Irrigation Special Project, in 5 districts from Karnali Zone Irrigation Project and in 9 districts from Mahakali Irrigation Project.
30. With the aim to provide year round irrigation facility in terai and inner madhesh regions with the use of underground water resources, shallow and deep tube well project is in implementation. Around 415,653 hectare agriculture land has received irrigation facilities with the construction of underground shallow and deep tube well by fiscal year 073/74.
31. The underground water irrigation project is under implementation in the tar, plains and fields available near riverbanks of 22 districts in the hilly region as well.
32. The Irrigation and Water Resources Management Programme (IWRMP) run by international assistance in 42 districts is ending in current fiscal year. Community Managed Irrigated Agriculture Sector Project (CMIASP-AF) is currently in operation with an aim to reinstate farmer managed irrigation projects in 35 districts of eastern and central region and provide reliable irrigation services.
33. Water Consumer Committees are functional in irrigations projects that are under construction and complete. There are around 30 such committees in big projects and about 5000 in medium projects. For the source operation of such committees in coming days, it is necessary to operate them and build their capacity under the concept of a cooperative.
34. Under the category of multipurpose projects with an aim to provide year round irrigation facility in command areas, detailed study of Sunkoshi Marine Diversion Multipurpose Project

and feasibility study of Kali Gandaki Tinaru Diversion Multipurpose Project and Sarada Dang Multipurpose Project is going on.

35. Various programmes are in operation for the control and management of erosion and flooding from different rivers. By the fiscal year 074/75, around 1000 km embankments and structures, river channelization, bioengineering, embankment and settlement conservation as well as landslide control have been done in different locations.
36. Embankment construction and integration activities in Bagmati, Kamala and Lalbakaiya rivers are in process. Peoples Embankment Programme based on community participation, Water Induced Disaster Minimization Programme, project for integrated development of Rupa lake and special programme for emergency as well as flood and landslide reconstruction are in operation.

(e) Hydrology and Meteorology

37. The statistics related to hydrology and meteorology is being utilized in design and construction of development infrastructures. Also, these statistics and forecasting service are being utilized in air traffic, tourism, disaster risk reduction, glacial lake outburst risk reduction, agriculture-weather service, flood pre-notice service, extreme weather service and different study and research.
38. Under Building Resilience to Climate-Related Hazards project started in 2013, one weather radar, 88 automatic weather measurement system, 66 water surface measurement system, 9 lightning network construction, 1 Radio Sonde center for weather status collection of upper atmosphere have been installed. Tasks like modern housing construction, fast computer system installation, necessary software and hardware purchase and installment for service flow are happening.
39. Department of Hydrology and Meteorology is 24 hours in contact with National Emergency Operation Center (NEOC) and District Emergency Operation Centers (DEOCs) in district level which are below Home Ministry. For information flow, Nepal Telecom and Ncell have signed in mutual agreement paper making disaster information flow effective.

Problems and Challenges

(a) Water Resources

1. Some goals out of all goals set by Water Resources Strategy, 2002 and National Water Plan, 2005 are not gained till now.
2. Water resources related diplomatic treaty (Koshi, Gandaki, Mahakali) between Nepal and India, various tasks are not able to be done through agreement and consent.
3. Although there has been expectation of Integrated National Water Resources Policy for a long time, it hasn't been possible.
4. It is necessary to develop essential policy and legal structure and capacity for dispute management that may occur between union, province and local level related to sharing of available water resources.
5. The collection, storage and management of documents and records of this field have not been fast and precise and the culture to use them in decision-making process has not been established.
6. There is a lack of policy arrangement for sharing of profit and risks in lower coastal countries and regions while doing unified and multidimensional development of water resources.

(b) Energy

Hydropower generation, transmission, distribution and trade

7. Although electricity development activities have been performed with a fixed goal from the first periodic project, achievements have not been as expected until current projects. As most of the hydropower projects are of run-of-the-river type, the demand of electricity has not been fulfilled due to the reduction in generation capacity during winter with the decrease in the flow of water in rivers. The main challenge is to arrange the maximum use of electricity in economic development by managing electricity generation, transmission and distribution based on the current and future annual electricity demand increment ratio.
8. In the future, there is a possibility of electricity generated from hydropower during rainy season going to be surplus whereas there might be deficit of electricity supply during winter. This will create a challenge is to maintain a balance between supply and demand throughout the year by proper management of available resources.

9. Because of the lack of consolidation of market and financial arrangements in the past, a condition for increase in investment and inability to achieve expected results has been created due to the lack of integrated development of projects that were identified by integrated river basin pilot projects.
10. There is a need to make policy arrangement for fair sharing of profit among projects made in the same river basin.
11. The inability to finish work in time because of the negligent and delaying nature of construction and consulting companies involved in construction of electricity generation, transmission and distribution line projects has come forward as an alarming problem.
12. Due to the arrangements related to damage of existing property, it has been difficult for projects to attain necessary land.
13. Controversy and differences with local people in subjects like land compensation, profit sharing and infrastructure construction to be done by project in local level also challenges completion of public and private level projects in time.
14. Usage of land along the transmission line has been a problem from time to time in transmission line construction. The provision of land reimbursement attached to the forest, which was not be leased for the transmission line has made it difficult to obtain the land and possible change in land use of most of the cultivable land.
15. There has been delay in decision making in permission, consent and approval to be taken for development and construction of project. Tasks like cutting, planting, deforestation and land acquisition to be completed by related officials of district/local level offices and due the officials of those offices having maximum regular work load, tasks have not been able to be completed in time.
16. Lack of construction materials from river like sand, ballast and stone, stoppage in its excavation, and right area like subjects have made it very difficult in construction of projects.
17. It is necessary to make policy, legal and institutional arrangement to achieve demand management by use of energy efficient electrical equipment and increasing energy efficiency in industrial sector.
18. For providing electricity service, it is necessary to ensure enough infrastructures.
19. To motivate stock market for investing in hydropower sector, it is necessary to address various risks.

20. Weak capacity of financial institutions and operation of distributed stocks inside nation has remained as a challenge.
21. Requirement in investment of energy sector by internal financial sector and government not being enough, there is a need of international investment provided from provident and business source. There is also a need of addressing effect of ups and downs in international regulation for it.
22. Utilization of public desire in energy sector investment and creation of environment for investment in possible projects and to put it in behavior has been a challenge.
23. It is necessary to ensure the market for the electricity that will be added to the system in the future after the completion of hydropower construction projects. There needs to be a harmony in time between investment and consequent construction of high-energy consuming industries and completion of the construction of hydropower projects. Since huge investment is required for the modernization and capacity expansion of distribution system to provide generated electricity to consumers, the management of the system is challenging.
24. It is necessary that the energy saved after internal consumption has reached access in the regional market. There is a need to bring SAARC Framework Agreement, B.B.I.N., The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) , other bilateral and multilateral electricity trade Agreement into implementation.
25. The non-technical losses from unauthorized electricity theft have to be minimized by control and monitoring of such losses with modernization and capacity expansion of distribution system.
26. In one hand, there is the uncertainty in construction time of identified projects with reservoirs while on the other, there exists a challenge to stop the construction of other infrastructures as well as planned or uncontrolled development of towns or settlements inside the reservoir area.
27. There is a need for knowledge and skills related to changing situations, rapid changes in technology as well as apt managerial and legal knowledge.

Alternative Energy

28. There have been adverse effects on human health and the environment because of the use of traditional sources energy, especially firewood. The fact that still around 74 percent of the country's population depends upon traditional energy for cooking and the percentage of traditional energy still being high in total energy scenario is a challenge for this sector.
29. In the perspective of maximum population of rural areas, using renewable energy as the main source of energy, there has not been expected investment in the field of renewable energy.

30. Balance between demand and supply of alternative energy, identification of target groups, sustainability of programme, technology transfer, and management of easy finances for the consumer as well as preparation and implementation of long term projects for sustainable development are the challenges in the field of alternative energy.
31. Because of not having formulated the desired periodic plan and annual programmes as per the strategy and plan decided by Rural Energy Policy, 2063 and Biomass Energy Strategy, 2073, the set goals have not been achieved .

(c) Irrigation and Water Induced Disaster Management:

32. Most of the irrigation structure being made in run-of-river concept, excess water is not able to be collected during rainfall period because of which reliable service of irrigation is not able to be provided.
33. It has not been possible to invest enough amount of money to meet aims in irrigation and water induced disaster management sector. Maximum demand in mini irrigation project, new technology based irrigation project, deep tube well irrigation project and river induced disaster management sector and because of multi-year contract agreement in these projects, many liabilities have been created.
34. Not being able to run programme as envisioned by Agricultural Development Strategy – ADS and not being able to co-ordinate between bodies of agriculture development have remained as problem.
35. Many irrigation projects constructed by Nepal Government’s investment are in chronic state. Programmes managed by government after completions of construction, in joint management and management transferred programmes have not been effective.
36. Loss of budget investment in water induced disaster management sector and minimum management in comparison to necessity has not made effective infrastructure construction in united way possible. Because of unavailability of enough budgets for maintenance of built infrastructure and being unable to properly run local infrastructure, expected outcome has not been met in this sector.
37. Use of land having or going to have irrigation service for other purposes through haphazard division and stopping the use of risky land have not been possible.
38. More compensation than usual and government rate in land acquisition have been demanded.

39. Water consumer communities have not been able to be subtle and capable.
40. Announcement of irrigation area as aimed by irrigation policy and irrigation system development in co-operative manner has not been possible.
41. The source to address emergencies as per the water induced disaster management policy has not been arranged.
42. Zoning of river areas has not been done. The activities of developing settlements and plotting of land by taking over river banks have not been stopped. Due to this, construction of embankments has become subject to disagreements and the construction work has been affected. The ones responsible for such activities have not been punished due to the lack of implementation laws.
43. A diplomatic approach is necessary to establish a bilateral agreement between Nepal and India to address problems related to irrigation, flood control.
44. Prevention of soil erosion, control of increase in river bottom because of sediment flow and reduction in disasters by effective management of river based construction materials has not been done.
45. The changes in sectors like unpredictability in availability of water, flood, drought, landslide and soil erosion because of climate change and the management of risks generated from such changes as well as the construction of climate change adaptive infrastructure have become a challenge.

(d) Hydrology and Meteorology

46. Network enhancement, improvement and modernization of centers related to hydrology and meteorology has not been done as expected. There is a lack of source for investigation and maintenance of Water and Climate measurement centers around the country. Along with the challenges in survey of glaciers and glacial rivers, there is also a lack of equipment and resources for such work.
47. In the context of agriculture- climate service and flood forecasting service currently being conducted by the department of hydrology and meteorology being extremely high, adequate human resources, means and equipment have not been made readily available.
48. The status of currently collected data is not of satisfactory quality. In addition, there is still a lack of human resources, means and equipment to manage and monitor data from automated devices.

Future Roadmap

For effective implementation of Nepal Government's 'Prosperous Nepal, Happy Nepal' campaign, 2075-85 period will be moved forward as 'Energy and Water Resources Decade'.

Policy Roadmap

(a) Water Resources

1. In accordance with the Constitution of Nepal, legal and structural arrangements will be made for construction and implementation of **Integrated National Water Resources Policy** to get maximum benefit through water resources development, conservation, management, regulation and integration, coordinated and multi-dimensional utilization between all levels of government and consumers.
2. Considering the principles of integrated water resources management, possibility of multipurpose utilization of water resources and inter basin water transfer and also considering the possibility of providing maximum benefit in the economic, social and environment sector of the available water resources, all river basin plan and various useful schemes are to be prepared under upcoming three years for development, management and utilization of water resources as per the plan.
3. Necessary arrangement will be made in the Water Resources Act to maintain the development, management, conservation, regulation and quality of underground water resource.
4. Necessary structural arrangements will be made to manage the future issues related to the optimum use and management of available water resources that may arise in the Union-Province, Province-Province and local level under federal structure. Also, the capacity of related working manpower will be enhanced.

Multi-Purpose and Inter-Basin Transfer Plan

5. Water resources available in Nepal will be developed as multi-dimensional and multi-purpose projects. Irrigated area from this project will have availability of water all year, hydroelectricity, flood control, drinking water, water traffic, recreation, tourism and environmental benefits as well as optimal use of available water resources. Due to the decrease of underground water surface from the use of underground water resources in Terai-Madhesh, recharge of underground water resources will be possible and from the strategic use of surface and underground water resources, agricultural productivity of Terai-Madhesh region will increase.

6. Policy related to inter-basin water transfer projects will be arranged and implemented.
7. Considering regional balance, demand and supply, generation mix as well as energy security, a reservoir project will be constructed in each province as far as possible.
8. Since inter basin transfer and development of large scale as well as reservoir based and multipurpose projects is not possible with only government investment, model of alternative investment including luxury loans and partnership will be developed and implemented.
9. Adequate modality will be formulated for construction, maintenance, repair and operation of dams, powerhouse and other infrastructure related to projects of multipurpose nature.
10. Policy arrangements will be made for the regulation of road construction and settlement development as well as other infrastructure construction projects in regions where reservoir projects are being developed.
11. Modality will be decided to share the benefits of lower coastal countries due to development of reservoir projects.
12. The issues between Nepal and India related to water resources will be addressed with the understanding and cooperation between the countries so that Nepal can gain maximum profit. For this, various bilateral mechanisms between Nepal and India will be made effective.

(b) Energy

The roadmap for energy sector in order to make the country independent in electricity by overall development of electricity sector, replace energy consumed from other sources by electric energy and reduce trade loss, develop internal as well as external market of generated electrical energy and provide sustainable, reliable, affordable, quality and clean energy to all by increasing the access to electrical energy and fulfilling total energy demand of the country is as follows:

13. Necessary policy, legal and structural arrangements will be made for implementing the rights of energy related association in province and local level. For this, Electricity Act and Nepal Electricity Authority Act will be revised as well as Renewable Energy Development Act will be formulated. Electricity Regulation Commission will be completed according to Electricity Regulation Commission Act, 2074.
14. Per capita electricity consumption will be increased up to 700 units (kWh) in the next five years and 1500 units within ten years by changing present condition energy consumption pattern and expanding the area of electricity consumption. For this, essential policy and legal arrangements will be made for replacement of other sources of energy by electrical energy in houses, public

and private institutions, traffic and industrial areas. In addition, emphasis will be given to establishment of industries consuming more electricity and the operation of electrical vehicles.

15. **'Special Lighting Programme for Education and Health'** will be conducted. For this, in order to increase access to modern energy in rural areas and to address minimum demand for energy in public schools, health centers and information centers, clean, reliable and renewable energy sources by using optimally will be promoted and widely expanded.
16. The policy of mixed energy system will be adopted for energy security. Energy efficiency will be increased for proper use of energy. For this, the activities for the integration of renewable energy projects in the National Transmission System based on net metering and net payment will be pushed forward with priority. Necessary policy, legal and institutional arrangements will be made to increase energy efficiency and improve energy intensity. The use of non-efficient electrical equipment will be discouraged. Necessary programmes will be conducted to increase the use of energy generated within the concept of waste to energy.
17. Special energy programmes will be conducted for the target groups for promoting social justice. Under this, living standards will be enhanced through the renewable energy use for targeted groups including underprivileged communities, oppressed group, obsolescent, indigenous nationalities, cultural and tourist areas. An arrangement will be made for the underprivileged groups to connect free energy meter. The rural electrification will be expanded rapidly by increasing the investment of government sector.
18. Different electricity tariffs will be determined according to weather and time for industrial, commercial and residential consumers.
19. Investment opportunities will be provided to citizens inside or outside the country for hydropower generation. For this, attractive hydropower projects will be selected and developed.
20. The country will be made self-reliant on electricity within the next three years. For this, generation, transmission and distribution line projects which are under construction will be completed within the given time. Electricity leakage reduction and control, load management and energy efficiency programmes will be effectively implemented.
21. Companies like 'Hydropower investment and development company', 'Electricity generation company', 'National transmission grid company', 'Nepal Electricity Authority Engineering Company', 'Electricity Trade Company' will be provided with equipment and resources and pushed forward.
22. As pilot project for electricity transmission, internal and cross border transmission lines will be developed in a phased manner. East-West high voltage transmission line of 400 k.V. level and

the similar transmission line will be built along the mid hill as well as river basin corridors. Study of high voltage transmission line of 765 k.V. level will be done by keeping long-term electricity transmission and cross border electricity trade in mind. The use of community land will be given priority for transmission lines. Arrangements will be made for direct profit to property owners having land directly under the transmission line.

23. Electricity distribution system will be modernized and integrated in order to bring generated electricity to the consumer. Existing distribution systems of major cities including Kathmandu will be strengthened and modernized. Industrial transmission line and substations will be expanded and strengthened to provide reliable electrical services to industrial and special economic zones (SEZ). Smart Meter and Smart Grid System will be implemented for the modernization of electricity system.
24. Special initiatives will be made to establish the reach energy conserved after internal consumption in the energy market of neighbouring countries. For this, SAARC Framework Agreement, BBIAN, BIMSTEC, Bilateral or Multilateral Electricity Trade Agreements and the concept of energy banking will be implemented.
25. The development projects of hydropower and transmission lines will be made more effective based on concepts like Public Private Partnership (PPP), Built and Transfer (BT), Build, Own, Operate and Transfer (BOOT), Engineering, Procurement, Construction and Financing (EPCF).
26. A policy to mobilize capital through foreign loans and grants provided by foreign banks and financial institutions will be taken to meet the need for investment in energy sector.
27. The policy of investing in hydropower will be taken for integrating hydropower investments owned by Nepal Government and distributed national capital due to long-term investment mechanisms and power bond through Development Company.
28. The power transmission line, communication infrastructure with highway and road will be implemented as per the concept of integrated corridor. Designing of new roads will be done in coordination with the transmission line as well. Infrastructure facilities which provide electricity and basic communication services in urban areas will be constructed in integrated manner.
29. Reduction and control of electricity leakage will be made more effective. For this, necessary legal, technical and administrative measures will be adopted.
30. The process of formulation of act for making the process of issuing licence of power projects more competitive.
31. If there are separate applications for surveying licence in run-of-river and peaking run-of-river projects for a specific area, peaking run-of-river will be given more priority as far technically viable.
32. The licence of promoters of electricity projects who do not achieve progress according to the laid down guidelines will be canceled.

33. Power purchase agreement of electricity projects will be cancelled if construction doesn't start within the specified period after power purchase agreement.

(c) Irrigation and Water Induced Disaster Management:

34. With main slogan of '**Increase in irrigated agricultural sector, prosperity for federal Nepal**', irrigation sector will be developed. To expand the irrigated area for agriculture and provide reliable irrigation facilities whole year, the implementation of inter-basin water transfer and multi-purpose reservoir projects will be done with strategic use of underground irrigation and use of new technologies.
35. With the slogan of 'River banks, Always green', lift irrigation projects will be run in the form of campaigns using solar power in cultivable land situated near river banks in the hilly region. This will increase the agricultural production in the hilly area while addressing marginalized farmland and marginalized farmers and there will be significant increase in the economic activities of the region.
36. For the maximum use of underground water resources available in Terai-Madhesh, intensity will be provided in the construction of shallow and deep tube wells. Reliable distribution line will be integrated in order to provide continuous electricity service and use of solar energy in the constructed tube wells. For sustainable operation, excess energy will be added to the grid on the basis of net metering.
37. For effective operation and maintenance of irrigation projects, ideas like joint management, management handover, public private partnership with consumer firms will be adopted. In irrigated areas, along with agricultural programmes, programmes like technology, fertilizer, seed, market development, cooperative development will also be effectively implemented.
38. Necessary legal and policy amendments will be made for the operation of deep tube wells for underground irrigation.
39. Legal and policy arrangements will be made to manage irrigation service charges.
40. Policy and legal amendments will be made to develop and manage consumer committees as cooperatives for the management of irrigation, water resources and water induced disasters.
41. Necessary amendments will be implemented in the Water Resources Act in order to stop development of settlements and other construction activities done by encroachment of riverbanks.

42. Capacity development will be done in all federal, province and local levels for the management of water induced disasters and development of water resources and irrigation. Model action plan, rules, regulation will be prepared in province and local level for irrigation development.

The existing water induced disaster management policy will be revised according to federal structure to play an important role in the management of disaster including province and local level.

(d) Hydrology and Meteorology:

43. The expansion in network of hydrological and meteorological centers will be done with existing centers to be made of international level by strengthening and modernizing.
44. The distribution system of hydrological and meteorological services and compiled data will be made smooth and easy.

Working Roadmap

(a) Water Resources

45. Construction of structures including tunnel, dam and power house of under construction Bheri-Babai Diversion Multipurpose Project will be completed within the financial year 2078/79.
46. Bidding process will be initiated in the coming fiscal year for construction of Budhigandaki reservoir project. Land acquisition, rehabilitation and recovery work will be carried out in a quick manner.
47. Comparative study and analysis of the multi-purpose projects of Sunkoshi-Kamala Division and Sunkoshi-Marine Division will be done before implementing appropriate projects from the next financial year.
48. Under the Bagmati River Basin Improvement Project, after completion of under construction Dhap Dam next year, the process of construction of Nagmati Dam will be started. This will add additional 440 liters/s of water flow to the Bagmati River.
49. Provision of irrigation facility throughout the year in 52,800 hectare command area is to be provided from 245 MW capacity Naumure Rapti Multipurpose Project under which Sikta (43,000 hectare), Praganna (5,800 hectare), Badkapath (4,000 hectare) irrigation projects are under construction and with aim of providing irrigation service, flood control, hydropower and

other benefits in 31,000 hectare of Kapilvastu throughout the year, implementation process will be initiated from next fiscal year.

50. The implementation process will be taken forward for Kaligandaki-Tinau diversion multipurpose project after completing a comprehensive study.
51. To expand irrigation services in Morang and Jhapa, comparative analysis will be done between Kankai Reservoir Multipurpose Project and Tamor-Morang Storage and Diversion Multipurpose Project and the suitable one will be selected.
52. Mega Reservoir Projects of importance will be developed to promote regional electricity market, multilateral investment and profit. For this, a modality will be prepared for detailed study as well as financial management and development of Karnali (Chisapani) Multipurpose Reservoir Project (10,800 MW) and construction process will be taken forward within the next five years.
53. A potential study for sea route connecting Koshi, Gandaki and Karnali to the sea will be done by the next fiscal year.

(b) Energy

Generation

54. Upper Tamakoshi Hydropower Project (456 MW) of national pride will be completed by fiscal year 2075/76.
55. Electricity projects with capacity of 3000 MW within 3 years, 5000 MW within 5 years and 15000 MW (of which 10000 MW for domestic consumption) within 10 years will be constructed and brought into operation by Nepal Government, Nepal Electricity Authority and its partner companies as well as private sectors. ***The description of projects is included in Annex 1.***
56. Under the programme '**One province, one mega project**', construction of at least one large hydropower/solar project will be started in each province:

Province No. 1: Tamor Reservoir (762 MW), Dudhkoshi Reservoir (800 MW) and Upper Arun Peaking Run-of-the-River (725 MW), Kimathanka Arun Peaking Run-of-the-River (450 MW), Arun-4 Peaking Run-of-the-River (372 MW), Lower Arun Peaking Run-of-the-River (679 MW)

Province No. 2: Solar Electricity Project of at least 200 MW

Province No. 3: Sunkoshi 2 and 3 Reservoir Based (1110 MW and 536 MW), Tamakoshi-5 Peaking Run-of-the-River (101 MW), Khimti Shivalaya Reservoir Based (500 MW), Kokhajor Reservoir Based Project (111 MW)

Province No. 4: Budhigandaki Reservoir Based (1200 MW), Upper Seti Reservoir Based (140 MW), Uttar Ganga Reservoir Based (828 MW), Adhikhola Reservoir Based (180 MW)

Province No. 5: Naumure Reservoir Based (245 MW), Kali Gandaki 2 Reservoir Based (870 MW), Madi Reservoir Based (253 MW) and Upper Jhimruk Reservoir Based (100 MW)

Province No. 6: Nalgaad Reservoir Based (410 MW) and Fukot Karnali Peaking Run-of-the-River (426 MW), Jagdulla Peaking Run-of-the-River (100 MW)

Province No. 7: West Seti Reservoir Based (750 MW) and S.R.-6 Hydropower Project (276 MW) and Chainpur Seti Peaking Run-of-the-River (210 MW)

57. Construction of at least one medium capacity attractive hydropower project with the share of provincial and local government will be carried out.
58. Providing opportunities to every Nepali from the high mountains, hills and tarai-madhesh region to invest in hydropower and to strengthen national unity through economic prosperity, 'Nepal's water people's investment, every Nepalese electricity share owner' programme will be launched as a campaign. Attractive and non-profit hydropower projects like Upper Arun (725 MW), Arun-4 (400 MW), Lower Arun (400 MW), Kimathanka Arun (500 MW), Bheri Babai Diversion (48 MW), Fukot Karnali (500 MW) and Tamakoshi-5 (101 MW) will be operated under this campaign. An arrangement will be made for foreign employed Nepali to provide shares application from the respective countries. Special arrangements will be adopted for the targeted and poor classes who cannot immediately invest.
59. Begnas-Rupa Pump Storage Hydropower Project will be developed as a pilot project to facilitate the operation of electricity system.
60. A campaign under the concept of 'Every House, Energy House', Energy Efficiency Programme and grid-connected roof-top solar energy in the houses with net metering and net payment method will be launched.

Transmission Line

61. To transmit the electricity generated from the under construction hydropower projects in national transmission line, the problems faced in the construction of transmission lines and substations will be immediately rectified and a special initiative with a fixed schedule will be made to complete the projects as soon as possible. For this, any land that falls on the right of way of transmission lines of 132 KV or higher will be taken on lease. Households affected by transmission line will be given special opportunity to invest in electricity projects.

62. On a long term basis, 400/765 KV transmission line parallel to East-West highway and Mid-Hill Pushpa Lal Highway and North-South 400 KV transmission line based on river basins will be constructed. **Description of transmission lines is provided in Annex 2.**
63. The construction of Second Cross Border Butwal-Gorakhpur 400 KV transmission line will be completed within the next four years and construction process for Lamki-Bareli, Duhavi-Purniya, and Kohalpur-Lucknow 400 KV transmission lines will start.
64. The construction of Galchhi-Rasuwadhi-Kerung 400 KV transmission line connecting Nepal and China will be completed in the next 5 years.
65. International transmission lines will be constructed by adopting Back-to-Back DC system as well.
66. For the purpose of completing the construction of transmission lines quickly and also to involve private sectors in the development of transmission lines, policy and action plan adopting the concept of using Built and Transfer-BT will be prepared and implemented.
67. Wheeling charge will be determined.

Distribution and Consumer Service

68. Distribution Pilot Projects will be prepared and implemented for each province within 1 year.
69. National campaign will be conducted for expanding transmission line and distribution line with partnership between federal, provincial and local government to bring electricity access for every Nepali people within the next five years. Micro-hydro, solar and wind energy with battery storage system will be used in areas where it is not possible to use grid.
70. In order to facilitate electricity supply in different Terai and inner Madhesh industrial corridors, transmission and distribution lines and substations of at least 5,000 MW capacity will be constructed in five years.
71. Keeping long-term electrical demand of major cities including Kathmandu, Pokhara and main cities in mind, distribution and substations will be strengthened and expanded. Underground cable work will be initiated to make distribution system safe and environmentally friendly in various cities including Kathmandu.
72. Action plan will be implemented in respect of increasing the use of private and public electrical vehicles and policy arrangements to motivate the use of such vehicles and action plan for charging stations-like infrastructures construction, based on the goal of increasing the use of electrical vehicles and increasing import of capacity vehicles to 50 percent within the next five years. Private sector will also participate in this work.

73. Under 'Electrical Stove at every home' programme, electrical stove will be encouraged to connect in every house. Business loss will be reduced by replacing gas import respectively from this programme.
74. Smart Meter System will be implemented countrywide within the next five years. Online Payment, Recharge Card Payment, Any Branch Payment System will be implemented countrywide for easy electricity bill payment of consumers.
75. The distribution system will be automated and modernized as smart grid system.
76. The leakage in electricity system will be reduced to less than 15 percent in the next five years.
77. Under demand side management, energy efficiency programme will be operated as a campaign through which electricity demand equal to 200 MW will be managed within coming 3 years.
78. The management of poles, wires and street lights on the side of the road will be done by cooperation with related body and effective implementation will be done.
79. Under the bright cities programme, local levels of major cities will be motivated to install smart street lights.
80. The unmanaged communication wires connected in electricity poles and towers will be managed by cooperation with related service provider. Also, charges to the service providers for using the structures of electricity authority will be modified on a time relative basis.

Electricity Trade

81. The task to diversify electricity trade as multi sellers and multi buyers in order to conduct wholesale and retail sales of electricity generated in Nepal on a long-term basis will be taken forward. For this, necessary legal and policy arrangements will be made.
82. Regional energy market will be promoted by making electricity trade agreements with Bangladesh and China.
83. Power purchase agreement will be made in order to connect electricity generated by micro hydropower, solar, biological, wind and sugar industry into the national grid.
84. For the aim of making the country independent with internal generation on a long term basis, electricity purchase agreement will be arranged on the principle of take or pay pursuant to the ratio of having reservoir and pump storage 30-35 percent, peaking run-of-the-river 25-30 percent, run-of-the-river 30-35 percent and other alternative sources 5-10 percent for the generation mix in order to achieve the goal of generating 15000 MW in the next 10 years.

85. Hedging fund will be established to minimize foreign currency exchange risk in electricity trade agreement.

Alternative Energy

86. Under the programme 'Every settlement, energy settlement', the government will establish challenge funds for all 753 local levels to connect solar electricity of 100-500 KW and pay for 50 percent of the investment. The generated electricity will be used by local levels for community activities like irrigation, drinking water and streetlights. There will be an arrangement to connect the surplus electricity after consumption into the national grid with a system of net payment.
87. In order to develop energy from province and local level, the model of different procedure, rules, directory etc. related to three levels of renewable energy will be prepared and implemented.
88. Necessary structural arrangements will be made to manage the future issues related to the optimum use and sharing of renewable energy that may arise between the Federal-Province, Province-Province and the local-local levels under federal structure.
89. For effective operation of renewable energy projects whose construction has already been completed, to guarantee service fees, to handle necessary maintenance, methods like consumer collaboration and public private partnership will be adopted.
90. Activities related to research, investigation and capacity building in the field of renewable energy will be conducted effectively. Also, activities related to capacity development of local and provisional government, assistance in policy making and planning, technology transfer will be carried out in the development and expansion of renewable energy.
91. Renewable energy funds will be made effective for operating and managing financial resources received from national and international level for the promotion, development and expansion of renewable energy.
92. For the development of renewable energy technology, data mapping, national level information and statistics will be collected, analyzed and archived. Use, experimentation, testing, research of latest technology of renewable energy will be conducted and sample scheme will be formulated and operated.
93. Alternative Energy Promotion Center will be established as Center of Excellence in renewable energy sector.

94. The resources received from carbon trade in national and international levels via development of projects related to emission reduction and disabling climate change with the use of renewable energy and energy efficiency will be used, managed and operated from Renewable Energy Fund.
95. National Carbon Market will be established and climate change customization and minimization projects related to renewable energy will be formulated and implemented by using the carbon fund.
96. Basic processing for gender equality and social inclusion will be done in the projects and programmes of renewable energy.

(c) Irrigation and Water Induced Disaster Management

97. All resources will be mobilized in maximum in order to complete large irrigation projects like Mahakali Irrigation Project (third phase), Jamara Kulariya, Babai and Sikta Irrigation Projects of national pride, Bagmati Irrigation Project and Sunsari-Morang Irrigation Project within assigned time.
98. Under the ***Integrated Energy and Irrigation Special Programme***, unified projects will be conducted from the next fiscal year with cooperation between energy and irrigation sectors as part of programme by the federal government. Under this programme, mid-western taar lift irrigation project will commence with investment from Nepal Government with an aim to provide irrigation facilities to around 10,000 hectare command field in the hilly region by using lift technology. Terai-Madesh Solar Lift Irrigation Project will be implemented as a campaign in order to develop underground water resources based on solar energy in around 22,000 hectare command field of Terai-Madesh.
99. Under Mechanized Irrigation Innovation Projects, detailed study and construction will be done with an aim to provide irrigation facility using solar energy connected lift technology in 14,000 hectare land of Tanahu, Lamjung, Palpa and Syangja as well as 40,000 hectare land of Sarlahi and Rautahat.
100. Programmes based on public participation to protect settlements, taar, agricultural land and structures damaged by erosion, drowning by big rivers, like Peoples' Embankment Programme, President's Chure Terai-Madesh River Control Programmes, River Control and Landslide Management Programmes of National Reconstruction Authority, Mahakali River Control Project (Darchula), Karnali River Control Project, Narayani River Control Project, Babai-Bhaadaa-Aurahi River Management Project will be made more effective.

101. With an aim to manage floods by institutional and non-institutional means in Rapti, Mawa Ratuwa, Lakhandehi, Mohana Khutiya, East-Rapti and Bakraha rivers in the terai-madhesh region, Priority River Flood Risk Management Project will be implemented.
102. For settlement, land and structure protection from big landslides in Chure, Mahabharat and mountains due to geographical situation, big landslide control and management with water resources management programmes will be conducted under Risky Landslide Control and Management Project.
103. With the slogan "**Development of irrigation for increasing agricultural production and productivity**", emphasis will be given to the co-evolutionary development of irrigation, agriculture and cooperatives. For this, currently organized Community Managed Irrigated Agriculture Sector Project – Additional Financing (CMIASP-AF) will be made effective. Also, Innovative and Climate Resilient Irrigated Agriculture Project will be started.
104. With emphasis on repair and sustainable maintenance of irrigation schemes, rehabilitation of large and great irrigation schemes will be carried out with priority.
105. Study and research on the impact of water resources, irrigation and water induced disaster management from climate change will be made more effective. Research and investigation will be conducted on current architecture due to climate change, change in crop due to temperature growth, change in water surface of underground water resources, floods, landslide and sediment yield.
106. From irrigation programmes as mentioned above, development of infrastructure for systematic irrigation services in additional 3,00,000 hectares will be available within 5 years and irrigation service will be available in about 45 percent of the total irrigated land throughout the year. This will bring economic prosperity with significant increase in agricultural productivity and production. Similarly, from programmes related to river control, construction of 300 km embankment and river control structures in the next five years will be completed with 1,100 hectares of land utilized for production work.

(d) Hydrology and Meteorology

107. Necessary mechanisms will be constructed for forecasting weather of 3 to 5 days in a specific area by making hydrology and meteorology forecasting more reliable and trustworthy and minimization of public damage through flow of extreme weather pre-notice.
108. 3 weather radars will be installed by fiscal year 2076/77. Certification work given for seasonal insurance purposes will be extended further.

109. Weather Channel and mobile apps will be developed to make information flow more effective.
110. Deep research activities to face the challenges brought by climate change will be carried out.
111. Along with the expansion of internal aerial weather services, aerial weather services will be established in newly constructed international airports.
112. Agriculture-Weather services will be established to increase the productivity of national agricultural sector.
113. Quality Management System will be implemented to maintain the standard of service flow and collected data.
114. Necessary arrangements will be made to take some special services provided by the department in a legal manner.

(e) Good Governance, Institutional Improvement and Capacity Development

115. Good Governance and transparency will be effectively implemented in the activities and service flow in the field of energy, water resources and irrigation.
116. The programme will be conducted with the objective of handling outcomes and public responsibility in this field.
117. The activities of cancelling contract agreements and blacklisting the construction companies and consulting firms that do not complete their responsibilities within the time mentioned in the contract will be made more effective. Additionally, the nature of construction companies taking more work than their capacity will be demotivated.
118. In order to achieve maximum benefit from projects completed in time, effective planning preparation, necessary budget appropriation, employee management, incentive system based on work performance, technical capacity enhancement and appropriate monitoring mechanism will be developed.
119. With research and development in water resources sector and in order to enhance the involved manpower capacity, the existing water resources development and research center will be rebuilt with further responsibility. From this, activities related to availability and management of water resources, sediment, water induced disaster, study in climate change-like sectors, research and capacity building will effectively operate.
120. In order to make project implementation, investigation with decision making support system fast and active and statistics management effective, methods like smart management, E-

governance and E-management will be adopted. Tasks like data digitization, library management, data unit establishment will be done for statistics management.

121. Pre-notice and flood management arrangements will be done with the cooperation of various non-government organizations working in this area, with development of infrastructure to obtain information directly from single door, and management of such information will be done in a scientific manner. Necessary training and capacity enhancement programmes will be conducted for this.
122. Training and various capacity enhancement programmes of technical manpower will be conducted for effective implementation, management and contract management of projects related to the energy, water resources, irrigation and water induced disaster management.
123. In order to speed up the work of constructing physical infrastructure, construction resources companies will be established with investment from government and private investors as well. Due to this, construction works will be completed soon with country self-reliant on construction and employment opportunities will also increase.
124. For provisional level electricity distribution work, eight regional offices under Nepal Electricity Authority will be converted into electricity distribution companies. Necessary legal and organizational arrangements will be made for this.
125. To make financial management, accounting system and other business activities of Nepal Electricity Authority based on the information technology, Enterprise Resource Planning (ERP) will be implemented making information transparent and technology friendly.

Finally,

This whitepaper will be as guidance for integrated development of energy, water resources and irrigation sector. This roadmap has been formulated by real illustrations and objective analysis of current situation, problems, and challenges of this area. Through this, sustained, reliable, affordable, quality and clean energy will be provided to all the people by making the nation self-reliant on electricity through overall utilization and management of available water resources in the country. Self-reliance on food will be obtained by providing reliable irrigation service throughout the year in cultivable land. And, there will be sustainable and effective management of water induced disasters.

Qualitative development of agriculture, industry, tourism, service and overall sector will occur from this and basis for double-digit economic growth in national economy will be prepared. Employment opportunities will be created for millions of Nepali people directly and indirectly.

And, we can claim, next decade will be the decade of prosperity and the main driver of prosperity will be energy and irrigation.

However, this work is not possible only by Ministry of Energy, Water Resources and Irrigation and concerned bodies of ministry. I appeal to private sector, media and common Nepali people for cooperation, collaboration and participation to complete this campaign.

Thank you.