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Low cost roads

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WATER, ENVIRONMENT AND MANAGEMENT

Low cost roads

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Alternative Approach to Road Building

Roads built by the Nepal Government and foreign donors are expensive and lack sufficient environmental considerations necessary for preservation of the fragile mountain ecosystem and communities with little or no technical planning supervision, and external financial support initially appears to be relatively cheap, but due to technical defects and lack of environmental concerns they are subsequently expensive to maintain and utilise.

The support by the Dhading Development Project (DDP) to the local roads programme (LRP) in the Dhading District of Nepal aims at introducing an alternative approach of road building, which is more economical and environmentally sound than the roads of both the Government and foreign donors and the communities. Learning from the experience of a similar programme in Palpa District of Nepal, DDP developed the conservation orientated participatory local roads programme (Acharya 1991 and Muller-Glodde 1991) of Dhading. DDP, with its professed philosophy of participation and institution building began in 1988 by searching for local organisations that could provide the initiative and leadership for such an undertaking. The district and local government both had the interest and support of local people to undertake the road programme. DDP entered into discussion and subsequently reached agreement with those organisations over planning and implementing of the programme.

DDP's conditions of support of the Dhading rural road programme were that the people constructed the roads themselves with the help of their local organisations and institutions, the roads were technically sound and ecologically sustainable and the local people accepted responsibility for future maintenance. Some major policies were agreed upon. Technically suitable alignment and designs would be implemented under proper technical supervision.

The local organisation would coordinate, train, motivate and develop local people would solve any problems such as land acquisition and compensation. Road construction would utilise the environmentally sound cut-and-fill technique of mass balancing, progressive and widening (to 4.5m and 6m at bypasses) over a period of 2 to 3 years, proper water management with natural drainage as far as possible, natural compaction by monsoonal rains and avoidance of use in the first year and during monsoons. Machinery and explosives were to be avoided. An innovative maintenance system was to be developed and agreed upon. Finally, the district would develop a road transport infrastructure master plan which ranked need and priorities to optimally use available resources.

The Rural Roads Supported

The rural earth surface roads presently under construction will not see heavy traffic in the coming decade, but, chosen by the people, they will open large areas of Dhading presently inaccessible to motor vehicles. From 1988 to 1990, a total 30.2 kms of ecologically sound local roads were constructed by participatory approach in Dhading district at a total cost (Acharya 1991) of NRs. 12,199,181.64 (US\$1 = NRs.47.70) This amounts to an expenditure of NRs.406,640.00 per kilometre of road. In comparison the Government agency currently spends roughly NRs 4 million per kilometre for roads of slightly higher geometric standard but of extremely poor environmental standards (Viz Malekhu Trishuli Bridge link road).

Institution Chosen for Programme Implementation

The District local government formed road construction and management committees to enforce programme policies and coordinate the implementation of the roads programme. The main committee at the district level is a policy making body which also coordinates and undertakes overall responsibility of the two roads. This main committee contains government officials and elected representatives of the district. "Road committees" formed by the main committee provide day-to-day supervision and site management, at the specific road construction sites. The road committees contain elected village and district officials of the area.

People living alongside the proposed road alignment are mobilised in groups of 15 labourers headed by group leaders called "naike". Local unemployed high school youths are trained and employed as supervisors are placed under overseers provided by the District Government Body and Project Coordinator. Guided by the engineering advisor and local road engineers of DDP/GTZ, the overseers provide the on-site guidance on resource conservation measures and road engineering. They direct their efforts towards working out practical solutions with the work force, rather than preparing elaborate but inappropriate engineering drawings. They also do the paperwork for wage payments and official formalities.

Participation and Local Contribution Realised Through

The road committee provides the leadership and initiative for road construction. It also organised purchases of materials and tools, mobilises and motivates the labourers and carries out necessary surveillance. The mobilised work force carries out the road construction work from November to June. The labour wages fixed by the main committee are arranged for monthly payment by the DDP.

Project Coordinator's Office. The labourers receive their wages in front of everybody from the accountants at the site itself, on the basis of muster rolls prepared by the supervisor, checked by the overseer and assigned road committee member and approved by the project coordinator.

Full accessibility of all institutional and financial arrangements and procedures of the programme, (budgets, books, records, attendance, muster rolls payments, expenditures, committee decision etc) to all concerned make them fully transparent. This discourages corruption by allowing the beneficiaries to quickly detect and correct wrong doing at the site itself. Fully involved, farmers freely provide required lands as part of the local contribution. Wages, established by the main committee through consultation, are reasonable and fair. they generally incorporate a percentage deduction (10%-20%) on generally inflated district wage rate. The proximity of the labourers' homes to the work site makes additional food purchases unnecessary, increasing their savings over migratory labour. The labourers agree to a working day one hour longer than the government one. Savings on contractors overheads, profits, contract tax, income tax, etc. by excluding contractors and maintaining transparency cuts out the immense losses of investments to middlemen or middle groups. The labourers carry home and care for the tools daily. The local people voluntary provide necessary logistics such as providing construction materials like stone, gravel and soil from their fields free of cost. All these participatory measures amount to a major local contribution to the LRP, making it extremely cost effective.

Along with construction, DDP is initiating an innovative method of road maintenance to be instituted within the local government structure, based upon participatory approach, which shares costs among beneficiaries.

Rationale for Conservation Orientated Participatory Approach

The Middle mountain regions of Nepal in which Dhading District is located, contain a large population, (about 300,000 in Dhading alone) and hence a considerable surplus labour force particularly during agriculture off-season. DDP regards the people as the most important resource, and the productive and efficient use of their surplus labour as the effective use of the region's natural resource. The participatory approach described helps the people help themselves, build their local roads and also bring the people to productive and efficient use. The approach involves the people in planning, decision making and implementation and thus helps the people to safeguard their needs and interests optimally. Some 75% of the investment made goes towards local income generation for the rural poor, without yet any disturbance of the normal agriculture production.

DDP regards the most important resource of Dhading as a properly preserved ecosystem. A degraded ecosystem is a liability. Indiscriminate use of explosives to weaken the mountain, use of heavy equipment such as bulldozers for earth pushing, cut-and-throw-downhill technique, etc. practiced by most other road builders threaten the

mountain ecology by encouraging mass wasting of the fragile mountain ecosystem. Mass wasting destroys the fields, the vegetation cover, and top soil. The plants, animals, other living beings and the environment which accommodates them constitute to the mountain ecosystem which is the life support base of the mountain farmers. Due to unsound practises, Nepal's mountains have already suffered too much from ecological degradation due to many reasons including road construction. The country can no longer afford to ignore ecology in the country's development endeavours.

DDP feels that a sensible road construction programme should not resort to destruction of the people's life support base simply because they are ignorant or that they do not protest. It should also estimate the cost of destruction of the environment by unsound techniques, practises and processes. The past trend of doing anything in the name of "development" needs redirection. For a country like Nepal, focus of each and every development activity must be towards ecological preservation and improvement of the mountain environment for the preservation of the people and their culture.

Resource Conservation Starts Already With

In recognition of the need for the preservation of mountain ecology, DDP has furthered Resource Conservation Concepts in local road building in Dhading. Resource Conservation is a simple, pragmatic and low cost approach which contributes to the long-run welfare and sustainability of local people. A set of simple techniques, policies and procedures leads to resource conservation and cost effectiveness in which environmentally sound local roads can be built relatively cheaply in almost every type of terrain. Resource Conservation in local road programmes begins before the start of construction in - selection of a geologically and technically optimum alignment and appropriate standards, deciding on appropriate techniques and technologies, planning the involvement of the beneficiaries of the programme in decision making and programme implementation, and deciding on the adoption of appropriate procedures for programme implementation.

Indicators of Environmentally Sound Roads

DDP's resource conservation technique of road construction produces an ecologically sound road section. The vicinity of the road remains neat and intact. DDP local roads surface and surroundings rapidly and completely develop vegetation cover and turn green. Completely absorbed into the landscape panorama, DDP green roads are invisible from a distance. The topography remains free from scars, landslips and other signs of land disturbances. Well drained by appropriate construction techniques and stabilised by vegetative methods, these ecologically sound roads suffer less damage from traffic and hence maintenance of the roads becomes relatively easy. Valleyside drystone retaining walls act as a natural barrier for cattle and goats, restricting grazing and allowing natural vegetation to develop rapidly.

The farmers who freely provide land for the programme because they have seen that these roads do not disturb

their land, plant and grow their crops confidently, right up to the edge of the roads. In other roads built by the careless mass wasting, the farmer's fields become covered with infertile soil, disturbing normal crop production for many years after road construction. The increased farmer awareness resulting from participation leads them to protest when their fields are affected and pressure not only the programme but other road buildings in the district to stick to environmentally sound principles. Learning from DDP/LRP, the farmers increasingly utilise environmentally sound techniques in their, own farms and communities.

Soft Biological Approach For Mountains

Economical, soft biological engineering measures reduce the need for uneconomical conventional hard engineering structures of concrete, steel, masonry etc. More sustainable and superior in fragile mountains, the use of vegetation in engineering relies on inexpensive labour-intensive techniques by agricultural labourers empathetic and knowledgeable with local vegetation techniques and varieties. the slope stabilisation is carried out simultaneously with construction to minimise soil erosion.

Dhading's Experience on Participatory Approach

The participatory approach (PA) is ecologically friendly and democratic. Labour intensive methods encourage introduction of innovative local techniques and skills into road building and channel a large part of the investment to the people to nourish the local economies and communities. PA requires simple techniques and technology which can be easily mastered. Technical support must go directly to the people, allowing the technicians to solve problems and assist actual engineering plans necessary for fulfilling official formalities and technical needs should be prepared. PA demand a slow and steady approach, geared to match the capacity of the institution supporting the programme. A "road committee" can only handle about 25 labour groups at a time. A district institution can handle no more than three "road committees" for about 6 months in a year. Designing programmes beyond the capacity of the local institution tends to invite introduction of "contractors" who, insensitive to people and environment, compromise the environmental standards and cost effectiveness. Although labour based methods and resource conservation measure require greater supervision, they utilise and develop local supervisory capacity. This decreases project costs and invests into community management capability. Contractors, administrative and technical officials, and other vested interest groups not surprisingly resist and undermine PA. Present road building practices benefit and reflect the dominating influence of these groups, which feel that they have the right to consume the budgets of the projects because they are qualified to carry out the official formalities (which they created). Consequently, PA is not a recognised system of central government bureaucracy. DDP/LRP has tried to bypass this group, but it has been often hindered by established norms, practices and regulations in favour of the contracting system. PA requires decentralised planning and management and devolution of authority down to the people. Programmes like the LRP in Dhading relying

upon local resources can not be accomplished by a central administrative organisation.

Cost Effectiveness

Through PA, environmentally sound local roads can be built in the mountains at 10% to 15% of the costs of geometrically similar but environmentally poor roads built by central agencies through the conventional contract system. The PA being a self-help approach, generates a very high level of direct and indirect local contribution. Cost savings are immediately visible. If the additional invisible costs of the degradation of the environment by unsound techniques and practices are properly calculated into conventional road building, these techniques can never be justified in the mountains. The present construction of local roads at NRs 4 million per kilometre means that Nepal's minimum rural road network can never be developed with Nepal's own economic resources or for that matter, even with the maximum support of the foreign donors. However, with an investment of NRs 0.4 million per kilometre utilising Dhading's experiences of participatory and decentralised system, even Nepal's own economy can fulfil the objective with the simultaneous preservation of the environment and enrichment and strengthening of Nepal's communities.

References

1. Acharya B N, 1991
Infrastructure Programme
Component Status Report,
DDP/GTZ, Kathmandu, Nepal
2. Muller-Glodde Ulrike, 1991
Where there is no Participation, Insights, Strategies
Case Studies, "Do's and Dont's" in Regional Rural
Development, Asia (GTZ), GmbH, Eschborn.
Local Participation in Rural Road Construction:
The Case of DDP, Nepal, pages 45-47.