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DRAFT OPERATIONAL PROGRAM NUMBER 11: PROMOTING SUSTAINABLE TRANSPORT INFRASTRUCTURE

This draft Operational Program is being circulated to Council Members for their review and comments. Council Members are invited to submit comments to the Secretariat by January 5, 1998. The document will also be posted on the new GEF website, www.gefweb.com on November 15, 1997 for public comment and review. The draft Operational Program will be revised and finalized taking into account the comments received.

INTRODUCTION

11.1 The United Nations Framework Convention on Climate Change (UNFCCC) seeks to stabilize atmospheric greenhouse gas concentrations at levels that would prevent dangerous anthropogenic interference with global climate. In 1990, the transport sector accounted for a quarter of the world's primary energy use and three-fifths of oil products use. Reduced emissions of greenhouse gases (GHGs) from this sector will be essential for stabilizing GHG concentrations. The Operational Strategy of the GEF in the Climate Change focal area initially emphasized three Operational Programs that address long-term program priorities of UNFCCC to mitigate climate change. This, the fourth Operational Program promotes the long-term shift towards low GHG-emitting and sustainable transport forms. Widespread shift towards low emission technologies offers some of the best prospects globally for achieving deep reductions in greenhouse gas emissions over the next century while satisfying the increasing demand for mobility.

GUIDANCE

11.2 At its first meeting, the Conference of the Parties (CoP) of the UNFCCC asked the GEF, as the interim operating entity of the financial mechanism...

...to adopt a mixed strategy wherein projects will be selected with a double set of program priorities as described in paragraph 9(c) of the [GEF] report, that is, if they meet either one of the long-term program priorities or one of the short-term program priorities.

11.3 The CoP also provided the following initial guidance that the GEF, as the interim operating entity of the financial mechanism of the Convention, should support agreed activities in Parties not included in Annex I to the Convention¹ that:

- (a) are country driven and in conformity with, and supportive of, national development priorities;
- (b) are consistent with and supportive of internationally agreed programs of action for sustainable development;
- (c) transfer technology that is environmentally sound and adapted to suit local conditions;

¹ When the GEF provides assistance outside the Convention's financial mechanism, it will ensure that such assistance is also fully consistent with the guidance provided by the CoP.

- (d) are sustainable and lead to wider application;
- (e) are cost-effective;
- (f) strive to leverage other funds; and
- (g) mitigate climate change.

PROGRAM OBJECTIVE

11.4 The overall objective of all Operational Programs in the climate change focal area is to reduce the risk of climate change by reducing net GHG emissions from anthropogenic sources and by protecting and enhancing removal of such gases by sinks. Reducing emissions from the transport sector will be fundamental to stabilizing GHGs at levels that will prevent serious anthropogenic interference with the climate system. The specific objective of this Operational Program is to reduce GHG emissions from *urban ground transport* sources in cities of recipient countries.² The objective will be achieved by facilitating recipient countries' commitment to adopt sustainable low-GHG transport technologies, and disengagement from unsustainable technologies common in many parts of the world. To date, the commercially viable application of these sustainable technologies has been slower than desirable from the perspective of mitigating climate change because one, they are more expensive, and two, the substantial external costs (such as pollution, noise, congestion, accidents, and greenhouse gas emissions) of prevalent technologies are seldom reflected adequately in current price signals.

11.5 Transportation systems require long lead times to change because they are interconnected and entail expensive infrastructural investments. First, there are several *links* in a fuel *chain* from fuel production to fuel transport to conversion to distribution to end-use, and ultimately to the service that is desired--mobility. Second, there are several alternative energy *pathways* for powering vehicles. For example, fuel cell vehicles can be powered by gasoline, methanol or hydrogen, each of which can be produced in several different ways. Finally, each link in the fuel chain has a development *sequence* from targeted research to full commercialization as described below in the section on GEF activities. A country would become committed to a sustainable transport chain only when each link in the chain has proved fully commercial and when the related infrastructure has been put in place.

² It is understood that all transportation projects shall be justified henceforth under this Operational Program instead of under Operational Programs 6 or 7 or as short-term response measures. Although unlikely, it is conceivable that liquid fuel production from biomass for non-transportation applications might still be justified under Operational Program 7.

11.6 The vision of this Operational Program is to move to very low-GHG emission transportation systems. To accomplish this, it would be necessary to allow *phasing*, i.e., temporary support of pathways and technologies that may not be low-emission but which facilitate the development of other critical links in the chain and accelerate commitment to the long-term sustainable solution. For example, temporary support of gasoline powered fuel-cell vehicles is justifiable since it could promote the lock-in of a sustainable technology when hydrogen is ultimately derived from non-fossil sources. See Figure 1 and footnote 3.

11.7 The assumptions that expected *outcomes* in this Operational Program will result in achieving program objectives concern **scope** and **replication**. Initially the scope of this program is limited to urban ground transport in a few countries where most of the cost-effective opportunities are assumed to lie for the *engagement* of transport technological *pathways* that will become non-GHG-emitting. Widespread replication of the general approach in this Operational Program in most other countries will take place once it has been shown to be successful in some. As these selected transport technologies become increasingly competitive in recipient countries, GEF will achieve its programmatic objective of more significant mitigation.

11.8 There is a risk that replication will not be adequate to achieve significant GHG mitigation because the cost of migrating to a sustainable transport chain will be prohibitively high in some countries. This risk will be controlled by providing initial support only for the most cost-effective prospects, and subsequent support for others only when the costs of technological options have substantially reduced.³

11.9 The programmatic global benefits will result from the combined effects of the commitment to sustainable transport technologies and their continuous deployment in several specified markets. These benefits can be estimated by the amounts of greenhouse gas emissions that were averted as a result of this deployment. Programmatic benefits also can result from structured learning from projects implemented. The effectiveness of this learning is estimated by more qualitative performance indicators.

11.10 Additional bonus programmatic benefits in reduction of GHG emissions could result when a successful engagement in one sustainable transportation chain is replicated in other chains incorporating similar links through forward and backward integration. Therefore, to the degree possible, the GEF would support activities that

³ For example, those countries that have not invested in major infrastructure for gasoline distribution could move more rapidly to cost-effective electric alternatives. In other countries where such an infrastructure exists, gasoline could be used initially for electric vehicles with fuel cells fitted with reformers, so that a commitment to electric vehicles could be made without having to write off major investments in petroleum distribution. A later switch to non-petroleum fuels can be made more gradually, and would be driven by the demand from large installed base of fuel cells.

influence multiple chains and would assist with dissemination of this learning and experience. (For example, successful commercial introduction of fuel cells in buses could be replicated in locomotives.)

EXPECTED OUTCOMES

11.11 A successful outcome is one when all the *links* in a selected sustainable transportation *chain* are put in place.

11.12 For cost-effectiveness, the scope of the technologies covered by the Operational Program needs to be limited to those whose costs will drop significantly with economies of scale in manufacture following engagement by several cities. However, to reduce the portfolio risks and to widen the geographical coverage, the scope of the technologies covered should not be too narrow. We expect the following considerations to be important in the selection of a sustainable transport technology:

- (a) extent to which basic RD&D has already been done (for technologies where the markets are both in recipient and developed countries) or significant prior operational experience exists; and the size of remaining technological barriers and risks;
- (b) technology's current cost and the prospects for reduction in costs of the technologies in question (steep learning curves);
- (c) contribution that GEF financing can make to cost reductions and to making the industry created to be independently economic when GEF support has ended;
- (d) extent to which the primary market is in the recipient countries because of resource endowment, market conditions and potential for that technology, when commercial, to reduce greenhouse gas emissions;
- (e) multiple domestic benefits from the technology (safety, air quality, easing congestion, etc.)
- (f) presence of local support, lack of local constituencies' opposition, and the possibility of using existing infrastructure to the extent possible; and
- (g) the possibility to influence multiple "chains".

11.13 After consultation with STAP, the following technologies would be emphasized initially:

- (a) Fuel-cell (Hydrogen)-powered buses;
- (b) Fuel-cell powered or battery-operated electric 2- and 3-wheelers;
- (c) Advanced biomass to liquid fuel conversion technologies; and
- (d) Hybrid buses.

None of these is fully available on the market. By promoting shifts towards them, GEF will accelerate their development and their deployment.⁴

11.14 One key assumption for getting the desired outcome is that the sum of the outputs of the various GEF projects and other specific activities will be sufficient to put in place the entire technological chain for a particular sustainable transport technology. In any given market, all the major links in the chain must be made commercial on a sustainable basis. It is assumed that the individual links in the chain can be identified, that the outcomes of GEF-supported activities will be the establishment of these links, and that once all such links are in place, the expected outcome will be achieved in that country. One example of such a chain is Hydrogen, derived from biomass and used in fuel cells to drive electric buses (Figure 1).

11.15 There are five major risks that combined outputs of projects in this Operational Program and other activities will not yield the expected outcome of the entire chain becoming commercially viable:

- (a) The first risk concerns that either through misidentification or neglect, not all links will be put in place, and therefore that the chain will not be formed. This risk will be controlled by ensuring that GEF will support activities only where an appropriate overall transport plan sets out how sustainable transport will be developed. GEF would support the development of such plans by financing the incremental costs of enhancing strategic transport or urban planning specifically to build in this additional long-term dimension.
- (b) Because the strategy in this Operational Program allows for “phasing”, i.e., financing of technology elements that may not result in immediate

⁴ The following are examples of what would be initially ineligible for GEF financing:

- a) Urban mass transit systems (prohibitively expensive and inability of GEF to make a significant difference);
- b) Electric cars (primary RD&D and market is in non-recipient countries);
- c) Activities to increase efficiency of present systems (reinforces engagement to present unsustainable systems); and
- d) Regular transportation planning (baseline and same reason as in (c) above.

GHG emission reductions, a risk exists of getting a lasting commitment to a non-low-GHG chain. For example, hydrogen for use in fuel cell vehicles could be produced centrally from fossil-fuels. Nonetheless, having converted a distributed non-point source problem to a point source problem offers the possibility of easier carbon sequestration.

- (c) Third, there is a risk that even a complete chain does not lead to a sustained commitment to the intended transport infrastructure. This risk is controlled by locking in a number of additional domestic benefits by choosing technologies that deliver substantial domestic benefits and also participate in multiple sustainable transportation chains. The additional domestic benefits include, among others, reduction of congestion and pollution, creation of new industries, opportunity for technological leadership and exports.
- (d) One of the risks with technology promotion programs worldwide, experience has shown, is that "surprises" are common. There is always a risk of picking technologies that fail to become least-cost in wide enough applications. This risk will be controlled by ensuring that there are alternative chains of which a link can form a part, so that the country can flexibly adapt to unanticipated technological and economic changes. For example, the electric motor technology is a link in each of the three pathways shown in Figure 1 for hybrid buses, fuel cell buses and of 2- and 3-wheelers. To minimize the risk of continuing to back a technology with no medium-term prospect of "lock-in", the scope above will not be fixed indefinitely but will be reviewed and modified on the basis of new information and experience in the portfolio. While the above sustainable transport options are expected to attract the bulk of initial GEF funding under this program, an application of a technology could be removed from this program (for example, upon reaching market goals). Likewise, this program will maintain flexibility to consider new applications as technological breakthroughs bring other promising solutions to the forefront.
- (e) The fifth risk is inherent in all of the GEF's long-term Operational Programs in climate change, is continued challenge from competing and currently entrenched technologies. For example, a countervailing reduction in international oil prices, or in prices of internal combustion engines, or a substantial increase in their efficiencies, will reduce the economic potential for the supported transportation technologies.

11.16 Monitorable indicators of expected outcomes of technological diffusion, engagement or succession are market share of the technologies, or riderships in

specified applications financed by the GEF. The indicator of programmatic cost-effectiveness of the use of GEF resources would be the increase in market share (above what it would have been) per unit expenditure of GEF resources. The overall financial sustainability of industries created will also provide indicators of successful outcomes.

PROJECT OUTPUTS

11.17 The direct outputs of GEF-supported projects will be the technical success of the activities supported. The monitoring indicator would depend on the technology being supported, for example, by the gallons of biomass-based liquid fuels produced, number of fuel cell buses or electric 2- and 3-wheelers produced, and the number of passenger-kilometers traveled.

11.18 A *sequence* of activities may need to be undertaken for the links to be established cost-effectively. Because of existing commitments to current transport infrastructures (no country will start from scratch), it will not be possible always to move immediately to establish the desired link. It is assumed though that in these cases an appropriate sequence of activities can be identified to establish the link.

11.19 The associated risks to cost-effectiveness of GEF operations are the following:

- (a) There is a risk that individual activities will not be sustainable and the sequence will not establish the desired link. This risk will be controlled by seeking as far as possible activities that individually will be commercially sustainable after the GEF support has ended i.e., independently of when other links materialize. This would be achieved by ensuring that the activity produced other additional domestic benefits for the community, providing reasons sufficient to sustain it. For example, there may be situations where battery powered electric three- wheelers would provide sufficient benefits in the form of reduced local pollution and increased opportunities for local manufacture, that once an industry to produce them had been established, it would survive.
- (b) When a demonstration project is executed for a specific business enterprise, conditions for competition may be distorted between this particular enterprise and other enterprises in the same industry. This risk can be minimized by a sufficiently broad specification of the technology, by an open bidding process for procurement, and by working with consortia.
- (c) One critical assumption in obtaining project outputs from GEF-financed activities is continuity of funding for a long enough period to ensure that

all the different elements in the sequence are addressed. Project selection will ascertain that each investment is domestically beneficial and economically sustainable.

GEF ACTIVITIES

11.20 GEF activities under this Operational Program will address identified national priorities and needs, and build upon previous GEF, bilateral, and multilateral experience. National priorities and future project opportunities are expected to be identified in National Communications and the several on-going enabling activity projects.

11.21 The activities would be coordinated with past, ongoing, and prospective work of the Implementing Agencies (in both their GEF and non-GEF capacities) and others to avoid duplication and to ensure cost-effectiveness. Primary coordination is required between UNDP, UNEP, and the World Bank to ensure that targeted research addresses information gaps on technology status and suitability; and that technical assistance, capacity-building, pre-investment, and pilot demonstration activities fit with follow-on investment priorities. Work has also to be coordinated with bilateral, multilateral agencies, and governments, as they provide the resources for baseline funding.

11.22 GEF will finance activities, including project preparation, on an incremental cost basis. The types of activities that can be financed include strategic planning, targeted activities in research, capacity building, technical assistance, and investments (see Figure 2):

- (a) Incremental costs of integrated **strategic urban/transportation planning** will be eligible for PDF-B support to set out plausible development paths to sustainability and to identify and develop projects under this Operational Program (paragraph 11.13);
- (b) **Targeted research** on integrating information on country resource endowment with cost-effectiveness of potential applications; on the present and prospective readiness; on potential costs and benefits of selected technologies and adaptation to local conditions;
- (c) **Capacity-building and technical assistance** for reducing uncertainties about costs, performance, and benefits; for strengthening local capabilities and institutions to operate, manage, maintain, and evaluate new sustainable transport technologies; for improving local capacity to integrate them, and for identifying, planning, and implementing follow-on projects. This category also includes institutional strengthening to adopt supportive regulatory frameworks, and financial evaluations.

- (d) **Investment** in the most promising applications conforming with Operational Program guidance. Cost reductions will be accomplished by promoting technology transfers, joint ventures, local manufacturing, learning by doing, and achieving economies of scale.
- (e) **Training** to operate and maintain new technologies and **dissemination** of learning and experience.

11.23 The cost-effectiveness of GEF activities will be higher where:

- (a) the resource base is near the project site (for example, in biomass to liquid fuels conversion projects) ;
- (b) stakeholders participate in the technology development and commercialization;
- (c) the market can mobilize complementary domestic, bilateral, multilateral, and private sector co-financing in support of program objectives;
- (d) there is a National Communication or other information about opportunities and priorities; the prospects for local manufacturing and joint ventures are good;
- (e) the technologies can be introduced in commercial environments as opposed to purely demonstration environments;
- (f) project structures assign technological and operational risks to those parties best able to control and mitigate them;
- (g) there are financial incentives for continued operations rather than a need for subsidizing recurrent costs; and
- (h) there is a conducive recipient country environment--
 - (i) GEF assistance will provide more sustainable benefits in those markets where severe energy price and other distortions do not tilt the playing field against sustainable transportation systems. A macroeconomic and policy environment that allows and encourages fair competition is desirable for promoting sustainable transport energy infrastructure, which should not be penalized by special taxes or by subsidies provided to competing technologies.
 - (ii) Environmental controls and safeguards are possible, e.g., on recycling and safe handling of lead-acid batteries.

- (iii) No significant lock-in exists to currently unsustainable technologies and infrastructure. If a lock-in does exist, disillusionment with the adverse impacts of current technologies have fostered a willingness to try low-emission alternatives.

11.24 Each GEF project proposal document will show which of the above characteristics pertain and how the activities will be coordinated. It will also:

- (a) justify the choice of the technology based on scientific and technical considerations, the resource base in the host country, and the prospects for sustainability and replicability;
- (b) set out the programmatic objective;
- (c) identify all the links in the energy chain and elements in the development sequence and identify critical bifurcation points;
- (d) estimate the level of funding required to achieve the programmatic objective and identify the necessary targeted research, capacity building and investment needs;
- (e) assess the programmatic impact of the GEF;
- (f) estimate the financial requirements and time horizon of the activities; and
- (g) show how the programmatic benefits will be monitored and evaluated.

11.25 Another key assumption is that transport chains can effectively be modified. Despite some limited experience gained by the Implementing Agencies from transport projects in the pilot phase, assistance for transport is a new endeavor for the GEF and comes with the risk associated with any new endeavor. This risk will be minimized through structured learning from experience. The history of transportation systems teaches us that the dominance of the internal combustion engine was not predictable during the early part of this century, but a few fortuitous events and positive feedback ensured its later ubiquity. This Operational Program attempts the similar positive feedback or virtuous cycles to achieve commitment to sustainable transportation technologies.

11.26 The success of these activities would be monitored by appropriate performance indicators of quality (e.g., were best practices used?) and of efficiency with which the inputs were used. The effectiveness of particular activities in capacity building, institutional strengthening, information dissemination, etc., would be monitored by performance indicators appropriate to that activity (project completion reports, use of best practices, and of efficient use of resources).

PUBLIC INVOLVEMENT

11.27 It is one of ten basic operational principles for GEF that its projects will provide for consultation with, and participation as appropriate of, the beneficiaries and affected groups of people. In some instances the direct participants in this Operational Program will be parastatal organizations. While the forms and degree of participation will vary, user participation is envisaged for all projects. The GEF Council has approved a paper on *Public Involvement in GEF-Financed Projects* that defines policies for information dissemination, consultation, and stakeholder participation in projects financed by the GEF.

RESOURCES

11.28 Given the long lead times for the development and deployment of highly capital intensive transport technologies, as well as the time required to move down learning curves, time horizons for the achievement of program objectives will typically be on the order of decades. Transportation systems can only be modified significantly on a 25-30 year time horizon. The technologies identified under this program will require the security of funding and long-term commitment of continuing GEF support. Analysis of indicative project pipelines and estimates of minimum "critical mass" of support for the various technologies under this program suggest an initial requirement of \$40 million per year in GEF grant resources, gradually first increasing to \$200 million per year, over 5 to 10 years as investment demand and absorptive capacity grow and then reducing as the program succeeds in its objective. The GEF will undertake further work on learning curves and on determining the longer term resource requirements.

Logical Framework Matrix for Transport Operational Program

Level	Description	Assumptions and Risks	Indicators
Program Objective	Reduce GHG emissions from urban ground transport sectors in recipient countries by facilitating commitment to low-GHG sustainable transport.	a) Replication in other chains via forward or backward integration provides extra benefits	. Net GHG emissions; . Indicators of structured learning
Expected Outcome	All the links in a chain are put in place for the following technologies: (a) Fuel-cell (Hydrogen) powered buses; (b) Fuel cell or battery operated 2- and 3- wheelers; (c) Advanced biomass to liquid fuel conversion technologies; and (d) Hybrid buses. Criteria for choice & exclusion --Domestic benefits, local constituencies, independently economic, non-combating entrenched interests, existing infrastructure	a) Scope--Urban ground transport provides most significant opportunities b) Replication in other countries; might prove to be prohibitively expensive	. Technological succession (market share, ridership); . Financial sustainability of new industry created
Project Outputs	All the elements (GEF Activities) of a development sequence succeed for each link.	a) Sufficiency-- All links in an entire chain need to be in place associated risk-- links are mis-identified, not all links are put in place; b) prematurely stuck. c) chain does not lead to lock-in d) wrong choice of technology e) challenge from entrenched technologies	. Technical success of the activity supported; . Amounts, numbers; . Prices
GEF Activities	Each element in the sequence; Depending on evolution and maturity, GEF would sequentially support both engagement and disengagement from unsustainable paths and phasing (critical points): Integrated Strategic Planning (PDF-B resources); Targeted Research; Capacity Building and Institutional Strengthening; Investments; Training and TA Criteria for support of GEF Activities: . Coordination among implementing agencies, bilateral, multilateral donors; .Public Involvement;. Conducive Recipient Country environment (list selectivity, right time, place[What should every project proposal show])	a) sufficiency-- sequence of activities is required to establish a link; b) risk of distorting competition; work with consortia; c) continuity of funding--but each investment economically sustainable and domestically beneficial;	. Cost-efficiency in the use of GEF resources; . Successful demonstrations; . Leveraging and co-financing; . Political commitment
GEF Resources	Start slow, maybe at US\$ 30-40 million/year, build to US\$ 75 in year 4, and then to US\$ 200 million/year in year 10, stabilize, and gradually reduce by year 30 as the program succeeds in its objectives.	a) Possible to modify transport "chains"; b) Continuity in support	. Annual allocations

Figure 1
Promoting Sustainable Transport Infrastructure
 GEF Operational Program Number 11

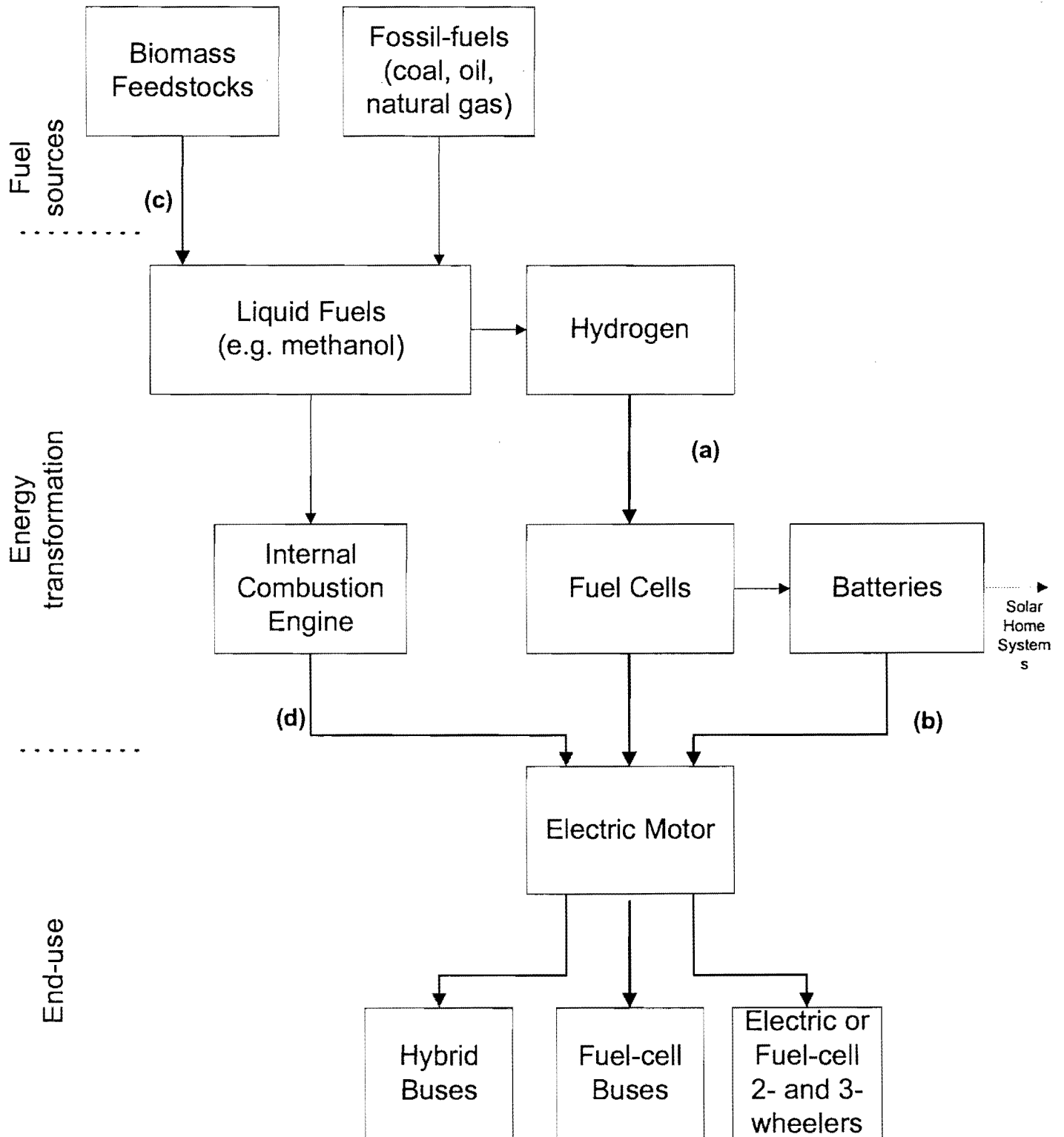
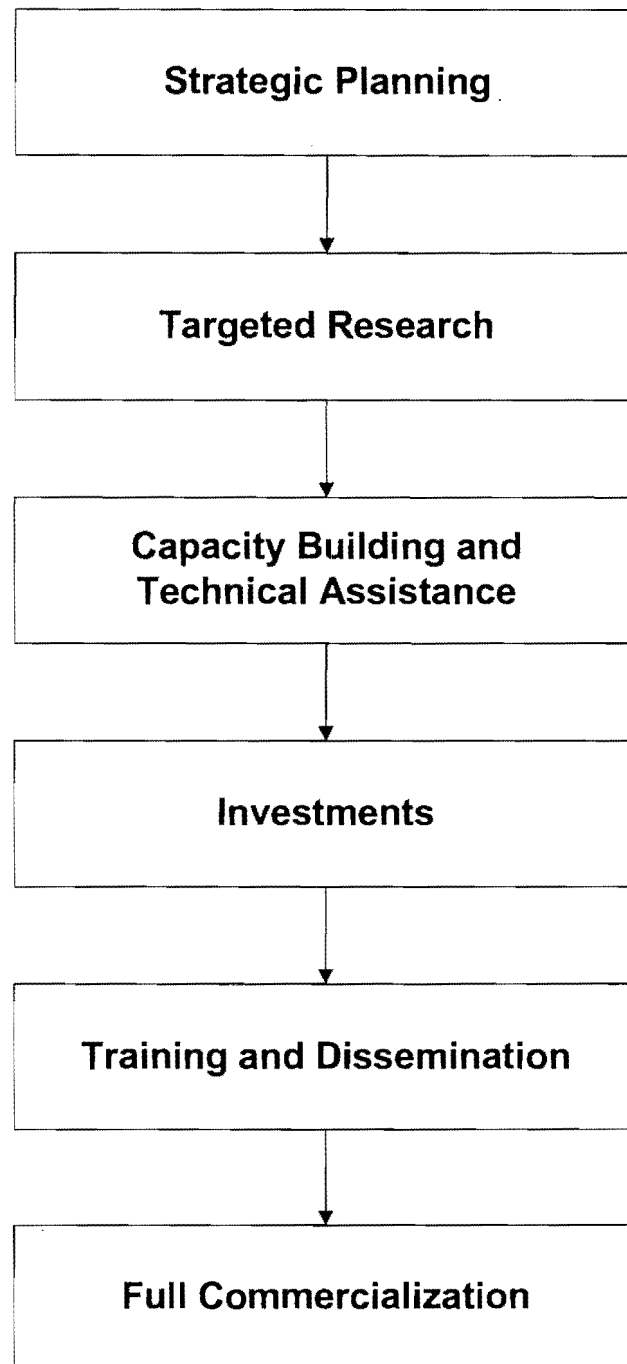


Figure 2



Sequence of activities that need to be co-ordinated to achieve full commercialization of each link in the transport energy chain or pathway.