Chapter 7: Actions, Results and Work Programme

Renewable Energy Sources:

Over the project period ENLIVEN intends to bring about the rejuvenation and expansion of a total of 10 villages of various sizes in Co. Offaly in an area bounded by the Slieve Blooms to the south east, the Shannon River to the west and the Grand Canal to the north over the project period. The N52 linking the large towns of Tullamore and Birr runs through Kilcormac and bisects the area. Three of the larger villages, Banagher, Ferbane and Kilcormac are designated as ecovillages in the Offaly County Development Plan; the others including 1st Phase Cadamstown and Ballyboy are listed as centres or emerging centres for development under the plan. Sustainable framework plans will be prepared with integrated infrastructure involving renewable energy generation linked to local distributed energy networks (minigrids) and high ecological standard water and waste infrastructure. Through Irish Rural Link, ENLIVEN aims to promote similar sustainable developments in villages in other counties over the project period. These are not included in the results collated here.

It is reasonable to assume that eight villages will have wind turbines as wind resources are generally good in the area, six will have one or more anaerobic digesters CHP as there is considerable dairying and animal husbandry in the better land in Offaly, and four will have biomass CHP plants as the local mountain range, the Slieve Blooms, are extensively forested. Hydropower generation is more problematic as both suitable terrain and a water source are required and only Cadamstown may have the right conditions.

The following is a table shows realistic estimates of the energy generation in Ballyboy and Cadamstown which comprise Phase 1 of the ENLIVEN project. It shows the total kW flow capacity, the percentage flow of kWTh (thermal energy) and kWe (electrical energy) and the estimated kWh (flow over time) for both. Figures are then derived for the capital costs of kW for each type of renewable energy source plant. It does not take into account the costs of fuel inputs nor of other annual running costs. Nevertheless it can be seen that wind turbines are relatively expensive in terms of capital costs but this has to be balanced by their nil fuel costs and low running costs and the higher value of the energy electricity it provides. In contrast, the biomass woodchip boiler with a Stirling engine provides lots of cheap heat energy but is quite costly in terms of the electricity it provides. But this electricity can be produced to kick in to meet demand spikes (unlike wind energy), a fact that makes the investment worthwhile.

Renewable Energy Sources	*Load Factor %*	Unit Cost	*Electricity V Heat*	Available KWe	Available KW Th	*Cost per kW Capacity*	*No.*	*Total kW (E&Th)*	Total Costs
Wind Turbine	35%	€1,200,000	100/0	262.5	0	*€4,571*	8	21,000	€9,600,000
ADCHP 500cu m	90%	€400,000	**37/45**	90	109	*€2,005*	6	1,197	€2,400,000
Biomass Stirling CHP	90%	€500,000	**13/87**	63	450	*€974.7*	4	2,052	€2,000,000
Small Scale Hydro Pumped Storage	40%	462000	100/0	80	0	*€5,775*	1	80	€462,00
RES costs Cadamstown and Ballyboy		€2,562,000		**415.5**	**559**			**53,947**	**€14,462,00**
Average cost per kW (E+TH) capacity				**€2,428**					**472,055,092 KWh**
Average Capital cost per kWh (over 7 year payback)				**€0.0395**					
ESB retail price for kWh E				€0.12		**€436,774**		**Max receipts for electricity Phase 1 (2 villages)**	
Best price for kWh TH				€0.06		**€294,052**		**Max receipts for heat Phase 1 (2 villages)**	

Figure 0-1 Renewable Energy; Production, Cost and Value

The final figures show what the energy might be worth at current prices were it provided by the ESB in the case of electricity or by Bord Gás in the case of the heat energy. If the energy were sold to local customers at 90% of the retail price, this would mean that €658,000 per annum (less financing costs, grid connection charges and ignoring the value of electricity sold to the grid) would be retained in the Ballyboy and Cadamstown communities. This result can be multiplied fivefold o cover all ten villages.

In addition, ENLIVEN proposes to replace 50 inefficient open fires, electric heaters and oil fired central heating boilers with wood pellet stoves (with hoppers and thermostats linked to five radiators) in houses in the rural area outside the reach of the Cadamstown and Ballyboy energy grids. A wood pellet manufacturing plant is proposed for Cadamstown to take advantage of the local cheap heat for drying biomass and off-peak local electricity for processing. A mobile wood-chipping machine is included in the calculations but the cost is spread over a large number of woodchip and wood-pellet boilers.

Energy plant			***Costs for 50 installations***	***Utilisable kWTh***	***Cost per kW capacity***	***Total kW 100 villages***	***Total Costs***
Wood Pellet Processing	For 2500 stoves		€2,600				
Wood Chipper	Shared over 5000		€5,000				
25 each village @ Pellet stoves & 5 rads	50 @€5000	65%	€250,000				
Remote RES per 50 houses			€257,600	357.5 (11kWTh stoves)	€14.41		
Average Capital cost per kWh	**€0.082**					**1,788**	**€1,880,00**

This shows that the capital costs per kWhTh is quite low but the processed wood-pellets have to be bought before any energy can be generated. As the fuel is harvested and processed in the immediate area it is possible to include its retail value in our calculations for village income. Should each household use 2 tonnes of wood pellets @€300 per tonne, (50% of the average Irish heating and electricity bill) the income to Ballyboy and Cadamstown could be €30,000 per annum. **Replicated over the total 10 villages this comes to 5x€30,000 = €150,000.**

Next it is worth looking at the carbon saved by the total ENLIVEN 10 village intervention. SEI figures show that the ESB emits 0.75 KG of CO2 per KWh generated. So every kWh generated by the project replaces a kWh creating .75KG of CO2.

RES	***KWh electricity***	***KG of CO2***
Minigrid electricity	43,405,800	32,554,350
Minigrid heating displacing ESB elec. for water	(49,008,650*20|%)	

and space heating say 20%	9,801,700	7,351,297
Remote RES (pellet stoves) displacing ESB water heating and space heating say 30%	4,697,550	3,523,163
Total CO2 tonnes saved per annum		43,428
Value CO2/t @	**€22.47 ***	**€975,845**

- **Price in August 2005**

Figure 0-2 Wood Pellet Energy: Costs and Co2 Savings

If a scheme were in place to reward initiatives which reduced CO2 emissions say at the value of tradable Co2 emission permits the savings in CO2 would be worth a staggering €975,845 per annum.

New Buildings

National regulations for new buildings based on the Energy Performance of Buildings Directive have not been set as yet so exact comparisons are difficult. The proposed new buildings consist of hemp/lime composite cast around a timber frame – the first time this type of construction will be used on a large scale. The energy required to process hemp/lime construction with timber frame is a fraction of that for conventional concrete cavity wall construction, the dominant form in Ireland. Co2 from transportation may be higher per volume of material as the hemp is currently only available from the continent and concrete is generally available within 20 miles. However, Marcus McCabe of EcoFlow Ltd, a potential SME partner, plans an Irish processing facility that should meet requirements of later phases.

Material	Thermal Conductivity [W/mK]	Compressive Strength [N/mm 2]	Embodied Energy [GJ/ton]
Cement		-	7.8
Timber a	0.13 – 0.18	-	0.52 – 7.1
Steel a	17 – 50	-	24 – 59
Expanded Polystyrene	0.033	0.11 – 0.15 @ 10% deformation	120.00
Rock Wool a	0.034 – 0.036	0.12 – 0.18	25.00
Phenolic Foam a	0.018	Unknown	27.78
Lime	0.6b	11.65	5.63 b
Hemp/Lime 5:1 Mix	0.11	0.7	1.06

(a: Values for these materials based on Roaf 2001)
(b: Values for this material based on Reddy 2001)

Figure 0-3 Embodied Energy for Common Building Materials [i]

A thermal conductivity of 0.12 W/mK has been measured by the Centre Nationale de Technicale Bureau (CSTB), France (Isochanvre 2004) for a mix of hemp and hydraulic lime. The material has further comfort enhancing properties from the high lime content that tempers humidity levels within the house. The thermal capacity of the lime content moderates diurnal temperature variations. The project will explore optimum mixes,

particularly increasing insulation at the external face. Air-tightness of the building envelope is a very important factor in reducing energy consumption in the Irish context. Hemp/lime can be installed around window and doorframes in situ to ensure a complete airtight seal. Lobbies control heat loss on entering and exiting the buildings.

A hectare growing hemp will produce 15 tonnes of drymatter which 9 tonnes is hurds/chives, 3 tonnes is fibre and 1 tonne of dust. A cubic metre of hurd weighs .15 tonne and 1 tonne occupies a volume of 6.6 cubic metres which is why it is uneconomic to transport over long distances as it is bulky not dense . One hectare will therefore grow 60 cubic metres of hemp annually. A rough estimate of the volume of hemp hurd required to construct the Cadamstown pilot project is 7005 cubic metres or 658 tonnes. This tells us that a planted area of 88 hectares is sufficient to grow a small village in a year. It also gives a significant Co2 saving in comparison to concrete block. Approximately 10,587 tons of concrete would be needed for the equivalent building area**. Since cement comprises 12% of the concrete, 1270.5 tons of cement would be saved.**

Embodied Energy for Cement and Concrete Production

	% by weight	Btus per ton Materials	Hauling	Btus/yard concrete	Energy %
Cement	12%	5,792,000	504,000	1,574,000	94%
Sand	34%	5,000	37,000	29,000	1.7%
Crushed Stone	48%	46,670	53,000	100,000	5.9%
Water	6%	0	0	0	0%
Concrete	100%	817,600		1,700,000	100%

Figure 0-4 Embodied Energy for Cement and Concrete

There are two very different sources of carbon dioxide emissions during cement production. Combustion of fossil fuels to fire and run the rotary kiln is the largest source: approximately 3⁄4 tonnes of CO 2 per tonne of cement. But the chemical process of calcining limestone into lime in the cement kiln also produces CO2. This chemical process is responsible for roughly 1/2 tonne of CO 2 per tonne of cement, according to researchers at Oak Ridge National Laboratory. Combining these two sources, for every tonne of cement produced, 1.25 tons of CO 2 is released into the atmosphere. Worldwide, cement production now accounts for more than 1.6 billion tons of CO 2—over 8% of total CO 2 emissions from all human activities. [ii]

This means we save approximately 1600 tonnes of Co2 for each village of a similar size using hemp/lime construction instead of concrete. **10 such villages represent a saving of 16,000 tonnes of Co2. Applying the value of €22.47 for carbon emissions per tonne we get savings worth €356,837 or €3,568,375 for 10 villages of a similar size. This figure does not include the Co2 which is absorbed by the growing hemp and locked up from causing harm for as long as the building is standing.**

Hemp is a valuable crop for a number of different reasons and uses. A recent study suggests that if the single farm payments under the EU Common Agricultural Policy reforms ceased and the subsidies to be cancelled, then hemp is the only arable crop which can survive and provide profitable farming of +£134 per hectare where flax shows a loss of £4 per hectare (Ref. ADAS report May 05 and Ernst & Young).[iii] **Based on these figures, growing enough hemp for one village in one year would give income of approximately €17,500 to farmers.**

The argon-filled k-glass timber windows will open fully for easy and safe cleaning from the inside. Efficient heat recovery ventilation will ensure healthy internal air and will replace the role of central heating. Cultural preference for a visual flame will be satisfied by Wood Pellet Stoves that will provide back-up heating on the very coldest days. Hot water and electricity will be supplied by district minigrids. In-wall and radiators central heating using hot water from the minigrid will be installed in the non-residential buildings depending on building usage. Solar panels feeding hot water into the minigrid will be installed on suitably oriented roofs of the non--residential buildings if the project budget permits.

Targets

1. Embodied Energy Savings of 80% over conventional masonry construction.
2. 20% reduction in thermal envelops U values over current Part V of the Building Regulations.
3. Space heating energy consumption 30% of current satisfying Part V of the Building Regulations.
4. Zero carbon space and water heating (from minigrids linked to RES)
5. No more than 7% extra over cost of conventional buildings (not counting grant aid). Pay back target: 5 years through combination of savings in energy bills and income from co–owned energy production facilities.

Retrofitted buildings

The project will also retrofit some existing housing. Some of these will be close enough to connect to the energy minigrids allowing them to completely replace their existing space heating and hot water systems. Remote one-off houses will be offered wood pellet stoves with radiators or pellet central heating to replace open fires and oil fired burners and boilers. New heating and hot water systems will be bundled with insulation, replacement windows and air-tightness measures into a total space and hot water heating package by the village development co and ESCo. Social rental housing (and fuel-poor private owners) will have the energy package subsidized by Part V and other local authority funds. Electricity connection and hot water services will be offered to village houses on similar terms. Replacement of light bulbs and energy guzzling appliances will form part of the electricity service package. A reduction of 70% of fabric heat-loss can be expected for older (pre 1980s) houses.

Targets: Village Houses: 250 units

1. Reduction in thermal envelop U values to satisfy current Part L Building

Regulations

2. Space heating energy usage per m2 to satisfy Part L Building Regulations. (60kW/h/m2a)
3. Reduction to less than 50% of previous energy use for space and water under normal use.
4. 20% reduction in non-heating electricity consumption in the building
5. Carbon neutral space, water heating and electricity (from minigrids linked to RES)
6. Pay back target; 7-year period by a combination of savings in energy bills, income from co-owned energy production facilities.

Targets: Dispersed Houses : 250 units

7. Reduction in thermal envelop U values to satisfy current Part L Regs.
8. Space heating energy usage per m2 to satisfy Part L Regs. (60kW/h/m2a)
9. Reduction to less than 50% of previous energy use for space heating under normal use.
10. 80% drop in carbon emissions (wood pellet stoves and rads)
11. Pay back target; 7 year period by a savings in heat energy bills

Expected Results:

The estimates below are extrapolated from the designs for Cadamstown and are indicative only. It assumes that on average, by the end of the project period, the ENLIVEN project will impact on approx. 50 new homes, 50 retrofitted homes, 1 community building, 1 service building and [1] commercial or manufacturing facility building per village. Thus over ten villages, ENLIVEN will impact on 1,000 houses, 10 community buildings, 10 service buildings and 10 commercial/manufacturing buildings.

Space heating Buildings	*Ave. m2*	*Ave. kWh/m2/yr Energy Saving*	*No*	*Total kWh*
New Residential Units	110	20% *less than current Regs*	500	880,000
Retrofitted village Residential Units	110	50% *less than estimated existing*	250	2,475,000
Retrofitted Remote Residential Units	110	50% *less than estimated existing*	250	2,475,000
Community building	300	20% *less than current Regs*	10	72,000
Service Building	200	*50% less than current Regs*	10	80,000
Commercial / manufacturing	500	*50% less than current Regs*	10	300,000
Total				**6,282,000**

Figure 0-5 Space heating savings

As we can see from Fig 10.2, energy savings due to intelligent design, construction and retrofit may eventually reach 6,282,000kWh as a direct result of the ENLIVEN project.

According to SEI, the energy expenditure in Ireland's 1.4 million homes stands currently at €1.8 billion. The average home spends €1,300 per annum on fuel and electricity and is responsible for 12 tonnes of CO2 emissions per year. As space and water heating tends to comprise more than 2/3rds of the total energy use, we can estimate that 8 tonnes is due to these uses. Extrapolating very roughly from this figure, and assuming cutting emissions by the percentages above we get a result of **3,700 tonnes of Co2 saved every year through conservation and solar panels by the ENLIVEN villages. At €22.47 per tonne, this represents a saving for tax-payers of €83,228 per annum if emission rights have to be bought by the government.**

Polygeneration, Hot Water and Electricity MiniGrids and ESCos:
Over a year, ENLIVEN will deliver 100% net renewable energy services through electricity and hot water minigrids in the participating villages. However, at any one time, the villages could be exporting or importing non-renewable energy from the national grid. Balancing of supply by suitable demand uses will be pursued through the planning process (the Framework Plan) and by the active participation of local development agencies supported by IRL to identify energy-hungry, job creating uses. Activities that are flexible enough to use off-peak electricity generated by the wind turbine, such as refrigeration or kilns, will be attracted by very cheap rates. For instance, the energy production and consumption balance in Cadamstown will be delivered by the swimming pool and by the drying and processing of wood thinnings for pellet stoves.

The local ESCo will make the extra costs of peak electricity use visible to users so that they have the option of postponing discretionary electricity use such as the drier or dishwasher until the energy demand and price, is lower. Metering and billing systems will be intelligent so that using electricity or hot water at the high demand times will cost more than the off peak times.

Storage of the energy generated by renewable sources will also be investigated by the further development of hydro and flow batteries in the second phase of village development when energy and supply demand profiles are fully established.

Transport related results
The First Phase will include two community owned electric vehicles which will provide a shuttle service for Cadamstown, Ballyboy, Kilcormac to Tullamore and Birr, the two nearest big towns. This service will be expanded if as it is expected, other villages within the immediate area join the project. It is also planned to include a car-share scheme as villages opt to join. Public funding will be sought for these bus services. **An estimated drop of 20% of car trips will be due to proximity of daily services over scattered housing plus a further 20% reduction due the shared transport.**

Environmental Benefits from Biomass Projects

Total biogas[iv] digester capacity is 30,000cu m with throughput of 547,500ton/yr at 10% dry matter (DM) producing 5.6Mwe and 5.2MW available heat after process needs are met. In addition there is considerable environmental benefit from the CH4 captured from decomposing organic waste. Farmers benefit too as plants more easily and safely absorb the nitrogen of the digestate output and soil compared to slurry or artificial nitrogen fertilizers; 90% total N available in separated digestate is available to them rather than only 20% in slurry. Consequently, farmers do not have to buy and apply as much artificial nitrogen and they can spread the digestate safely for a longer period of the year.

90kg CO2 equiv saved /t biomass treated	= 49,275t CO2/yr equivalent saved
Value CO2/t @€22.47/t	**= €1.1m pa**
0.11kg N lost to water saved/t biomass treated	= 60.2t N to water saved
Value N loss saved @€0.39/t biomass treated	**= €213,500 pa**
Artificial N saved	= 3.5kg N /t biomass treated

Spreading with the same restrictions of total N /ha (under N regs 170kg N/ha) as slurry

Value of artificial N replaced = 1,900t pa @ €1,036/t N = €1,987,000 pa
Odour reduction value @€0.67/t biomass treated = €367,000 pa

Figure 0-1 CO2 and Nitrogen Mitigation Effects of AD

It is preferable to replace some animal manure with other organic waste from municipal and food processing sources as this can improve gas yields and manure value. Good practice would advise a mix of up to 70% manure waste by dry matter If this approach was taken there will be a saving in waste disposal charges for the non-farm waste which has been shown to be equivalent to €16.82 per tonne of biowaste treated. If the biowaste has a dry matter content of 20% on average and forms 30% of the feedstock by dry matter then this will mean 82,125 tonnes of biowaste per annum could be treated resulting in a saving of €1.4m per year in waste disposal costs

Other Results

- The establishment of a national local energy advisory agency which has detailed information on the performance and reliability of innovative energy supply and end use technologies, as well as the social impacts, quality and added values of the energy services provided. This agency set up by Irish Rural Link would make it possible for many villages to develop on ENLIVEN lines.

- A Village Development Company which helps local authorities to prepare sustainable framework plans and which can partner them to carry out the energy, waste and other infrastructural works identified under the plans using funding from Section 49 Special Levies.

- A functioning ESCo in Offaly with field experience of energy flows (supply and demand patterns), in local areas having a high percentage of renewable energy supply.

- Ten Village Management Companies with significant assets in renewable energy generation facilities, minigrids community land and buildings.

- A major international conference and publication to disseminate the technical and socio-economic analyses from the project. Policy papers informing new regulations for distributed electricity generation; fiscal instruments including an examination of inter alia green credits, tradable carbon quotas, the capture of enhanced land values due to renewable energy services investment, policies to increase widespread citizen and community ownership of energy assets.

- Continuing professional development courses for private and public sector engineers, architects and planners.

- National workshops on research, development and sustainable framework plans – to pass on information and to get feedback from others involved.

- National workshop on agricultural issues related to utilizing existing biomass resources, new crops and use of by-products of biogas

- Internal and cross-community discussion groups on their experiences with developing Ballyboy and Cadamstown systems

- Leaflets written for for local authorities on Sustainable Framework Plans

- Links into existing relevant EU networks

Work Programme

Phase 1: ENLIVEN will

1. Carry out the mixed development in Cadamstown including the waste treatment facility and biomass CHP plant, wind turbine and mini heating and electricity grids as per Planning Permissions obtained and the standard outlined in this report on the Langton site. t will also carry out the housing development and the biogas CHP system in Ballyboy and carry out two further housing schemes for nineteen houses in Kilcormac to similar high ecological standards.

2. Source the wood waste and thinnings for the biomass CHP in Cadamstown and the agricultural slurries and other organic wastes for the biogas CHP in Ballyboy and prepare contract agreements with the suppliers. Negotiate and

agree energy supply and purchase contracts with the ESB or Airtricity and supply contracts for domestic and commercial users of the electricity and hot /cold water.

3. Test the innovative materials construction and methods of housing and commercial buildings for performance against the relevant Building Regulations and the 'excellent' standard to be set under the Energy Performance of Buildings Directive in Ireland. Commission and test the electricity and hot water generation, delivery, metering and payment systems. Commission and test the innovative wastewater treatment systems.

4. Fund the Irish Agrément certification process for the hemp-lime composite construction system proposed in Cadamstown.

5. When all the buildings in the Cadamstown and Ballyboy developments are completed, sold or otherwise disposed of, convey the energy minigrids and community buildings and lands and freeholds of the buildings (or as negotiated) to the management companies for each development. Convey the energy generation facilities to the management companies or/and to third party investors as identified best by research. Convey the roads and public spaces and waste treatment system to Offaly Co Co (or as negotiated).

6. Identify or initiate an Energy Services Company (ESCo) to maintain the energy grids, manage the energy generation facilities, metering and payments systems and help negotiate initial contracts between the management companies and the ESCo for its services.

7. Carry out the necessary research to deliver the above in the short term while also identifying regulatory and financial impediments and opportunities to mainstreaming the programme in the medium term. Prepare policy recommendations for government and local government based on the above.

Phase 2 ENLIVEN will

8. Conduct preparatory surveys for Framework Plans;- ground levels, land ownership, property valuation, inventory of built and natural resources, inventory of local community needs etc., for Cadamstown, Ballyboy and Kilcormac.

9. Prepare village framework plans in consultation with landowners and the wider local communities showing a 3-year development scenario. Prepare cost estimates for infrastructure to include further renewable energy generation and community needs (services, new social and affordable housing and upgrading existing). Prepare valuation of completed development. Prepare agreements with landowners for phased development and the amounts

and phasing of Section 49 development levies and Part V agreements. All the above in close collaboration with Offaly Co Co.

10. Set up a joint or partnership infrastructure development company with Offaly County Council - the Village Development Co;- to undertake the infrastructure works identified under the Framework Plans.

11. Support the Village Development Company to carry out the infrastructure works, extending the ENLIVEN Phase 1 roads, drainage, and the electricity and hot water mini-grids to service further lands in Cadamstown and Ballyboy. This is likely to include a dam and hydro electrical generator in Cadamstown. Construct new energy and/or waste facilities and grids in Kilcormac as identified under its framework plan- likely to include a further biogas CHP plant.

12. Provide professional design, construction and services advice to landowners of the newly serviced sites in the villages to enable them to achieve similar quality standards to the Phase 1 developments in their buildings.

13. Provide professional design services to Offaly Co Co for the retrofitting of existing social or qualifying houses in the village and wider rural area using funds obtained under Part V. Work to include installation of external wall insulation, draft proofing, secondary glazing, and wood pellet stoves with radiators. Target: 50 houses for 1st Phase.

14. Provide professional consultancy to Offaly Co Co for the new community buildings identified by the framework plans and for the retrofitting of existing housing in the village hinterlands to high energy standard (insulation, sealing building envelopes and replacement of fossil fuel boilers with wood pellet) using receipts from the Section 49 development levies agreed under the framework plans.

15. Set up village asset management companies in each village for the lands serviced under the framework plans to take ownership of the new community buildings, land and waste and energy assets. They are conceived as suitable entities to take over the Phase 1 management companies and their assets (and other local authority or community assets as appropriate and agreed). These village asset companies are likely to be joint or partnership companies with Offaly County Council. This will provide for the proper and efficient management of the energy grids and waste water systems for each village. It also allows for the responsive management of community-owned lands and buildings to meet changing demands.

16. Draft a guide contract and support the appointment of an Energy Supply Company (ESCo) to manage the energy assets of all villages following evaluation of the energy management of the phase 1 development.

17. Conduct trial plantings of hemp to test its viability as a crop for farmers in Ireland, particularly in the beet growing counties. Further field trials into growing rape seed for bio- fuel in Offaly conditions.

18. Evaluate of phase 1 and 2, and conduct further research and policy development; disseminate results in websites, conference and publications; liaise with professional associations to inform their continuing professional development (CPD) programmes. IRL will also conduct an information campaign aimed at local development organisations and County Development Boards on the learnings form ENLIVEN.

Phase 3 ENLIVEN will

19. Set up a Local Energy Advisory Agency within the auspices of irish Rural Link to assist local authorities, local development agencies and/ or private individuals and companies realize small-scale distributed renewable energy systems and ESCos in their rural areas.

20. Extend ENLIVEN project into a further 7 villages including designated larger villages/towns of Ferbane, and Banagher.

21. Consult with the professional associations such as the Royal Institute of Architects of Ireland the Irish Planning Institute, and the Royal Town and County Planning Institute and the Department of Environment, Heritage and Local Government with the intention of setting up a village framework plan advisory agency that would act as a resource for local authorities and local communities to assist the rapid roll out of further highly sustainable framework plans.

22. Consult with Teagasc and the IFA to develop markets and to assist farmers better utilize farm wastes for energy outputs and nutrient inputs and to expand biomass and bio energy, building material and other non-food crop production.

23. Carry out further research into financing structures and fiscal policies that would support rapid growth of private and public investment into renewable energy generation in preparation for predicted fossil fuel scarcity. Particular attention will be paid to systems, which can also respond to the challenge of supporting an increased elderly population cohort.

[i] O'Dowd and Quinn, 2004, *An Investigation of Hemp and Lime as a Building Material*, Department of Civil Engineering UCD

[ii] Environmental Building News March/April 1993, *Cement and Concrete: Environmental Considerations.*

[iii] NIRECON Ltd**,** *FeasibilityStudyof a Fibre Primary Processing Plant In Ireland,* 2005, private unpublished.

[iv] Figures used for calculations are from 'Centralised Anaerobic Digestion Economics and Externalities' Danish Food and Resource Economics Institute 2002