SCAD ECO-HOUSING PROJECT BRIEF
## Smarter Urbanisation and Rapid Growth (SURGe)

This proposal sets out how The URBED Trust can help the SCAD Group of Institutions in Southern India show a better way of building new homes and communities that would meet local as well as national needs.(www.urbed.coop.uk)   SCAD (Social Change and Development) is a leading social enterprise in the State of Tamil Nadu. SCAD has built up a strong reputation over 35 years for ensuring '*the poor and marginalised are empowered and take responsibility for their development'*. www.scad.org.in This project to develop and fund a **demonstration project** grew out of discussions between Dr Nicholas Falk of URBED, and professors at SCAD's Cheranmahadevi campus, after a conference on Sustainable Development back in 2015. SCAD's founder Chairman, Dr Cletus Babu gave his support for the idea, which has since drawn on extensive interest and support from experts in the UK.

Dr Nicholas Falk's proposal to fund the building of up to five houses that can act as models for **eco housing** in future urbanisation, will be backed up by a grant to fund a project manager, an essay prize, and a 'toolkit for smarter urbanisation'. This would contribute to the City of Tirunelveli's bid to become one of India's 100 **Smart Cities,** and the State of Tamil Nadu's objective for creating 'world class cities' India's future depends on 'smarter urbanisation' so that medium sized take the pressure off mega cities like Chennai, and avoid either wasteful suburban sprawl, mushrooming tower blocks, or informal shanty towns. New housing must therefore be affordable to people migrating from rural villages, use public transport to get to jobs in neighbouring towns, and minimise the environmental 'footprint'.

One promising model is the Garden City, which was pioneered in the UK at Letchworth, and subsequently in English New Towns, and Indian cities such as Bangalore and Trivandrum. URBED's submission that won the 2014 **Wolfson Economics Prize** showed how historic English cities like Oxford could double in size and tackle issues of congestion and flooding. (urbed.coop/**wolfson**-economic-**prize).** The key to success is developing land at the edge of existing cities that can be well-connected by public transport. Critically, part of the uplift in land values should be invested in local infrastructure. The SCAD Eco-Housing project seeks to establish whether similar principles can be applied in India at the street, neighbourhood and city levels, and help cities such asTirunelveli grow in more sustainable ways.

The project should offer the following benefits:
1. Creating a practical example for affordable and sustainable housing (as SCAD projects such as bio-digestion and wind power have already done for energy).
2. Providing a set of principles for construction and urban design that can be replicated more widely, (such as in the Municipality's project for Tirunelveli Smart City and a new community at the expanding town of Pettai).
3. Opening up practical training and future jobs or business opportunities for engineering and MBA graduates.
4. Enabling collaboration between experts in British universities and their equivalents in Southern India.
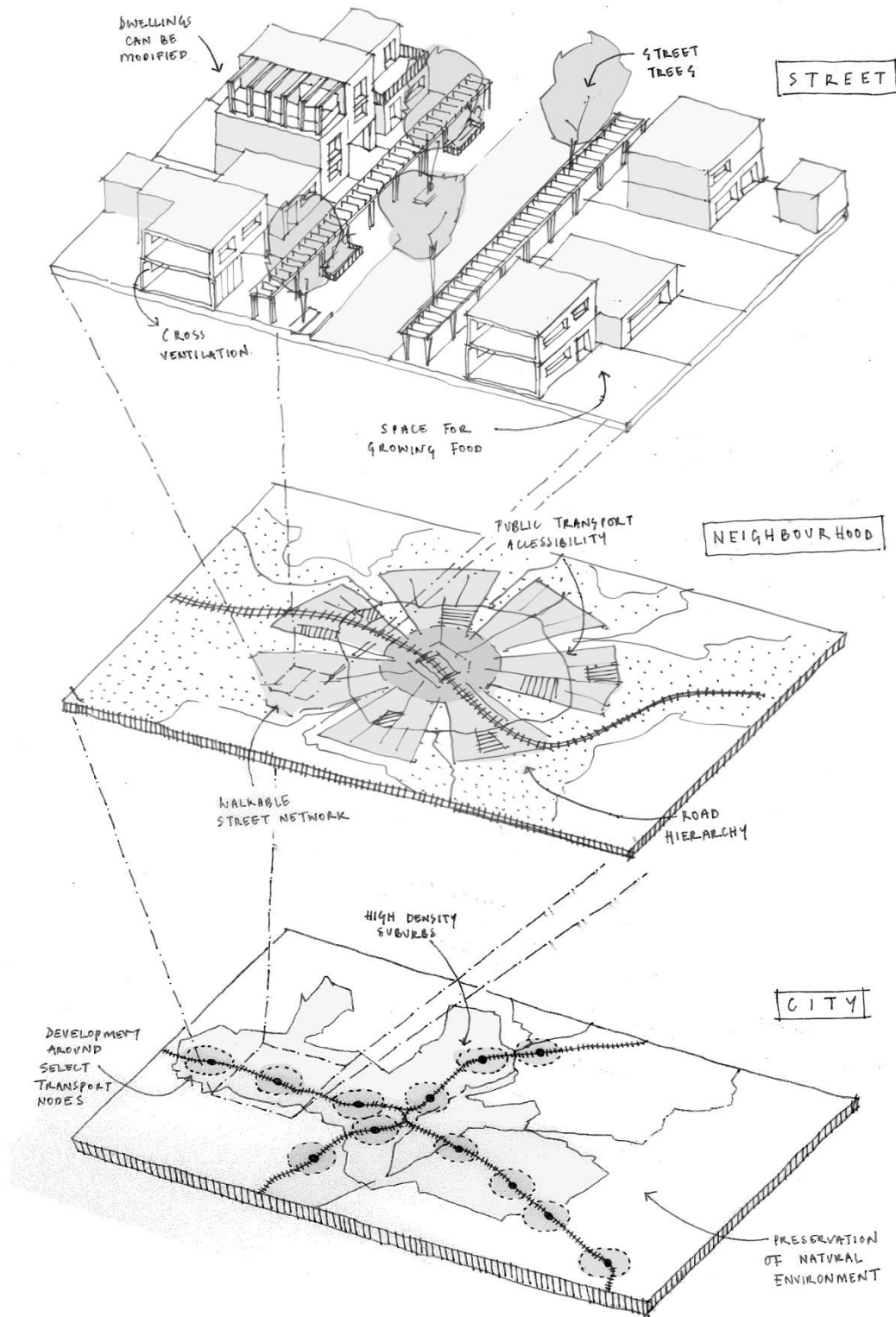
Illustrative Smarter Urbanisation Development Framework

1. Aims of the SCAD Eco-Villages project

1.1 The SCAD 'eco-villages' project forms a building block in an ambitious proposal to test out the application of 'garden city' principles to the growth of the City of Tirunelveli and its

surrounding suburbs, and to develop the skills and job opportunities for staff and students at SCAD (Social Change and Development) www.scad.org.in   The local authority is competing to become designated in the government's Smart City programme, and hopes to build an exemplary new settlement on the edge as well as to take traffic out of the historic centre. If the city were to double in size by 2050, assuming a growth rate of 2% a year, there is a danger of land being taken away from productive agriculture, and congestion on the roads becoming socially and environmentally intolerable. It is therefore vital to have a strategic growth plan that incorporates the surrounding suburbs and villages, and avoids over-dependence on cars.

1.2 URBED's proposals are based on applying lessons from experience to using land that would not otherwise be developed. With the help of ConnectedCities, a social enterprise based in London, we have identified potential land close to railway stations that might be suitable for housing development.(see Tirunelveli case study in www.connectedcities.co.uk) It is also important to find ways of reducing carbon emissions and pollution, by minimising the use of concrete and using natural materials instead. The new homes need to be affordable to people whose basic incomes mainly come from agriculture, and to offer better options than currently available. Above all water must be used more carefully to avoid times of drought.

1.3 The principles applied in the original garden cities and new towns in the UK, and promoted by the Town and Country Planning Association, could offer a proven way forward for some mid-sized Indian cities, provided there is a suitable delivery and financing mechanism. URBED's award winning proposals for Uxcester Garden City may provide some of the answers.[1] A framework for how they might be applied in India is set out in Appendix A, and will be refined as the project proceeds.

Garden city principles (TCPA 2012) [2]
• strong vision, leadership and community engagement;
• land value capture for the benefit of the community
• community ownership of land and long-term stewardship of assets;
•mixed-tenure homes that are affordable for ordinary people;
•a strong local jobs offer in the garden city itself & within easy commuting distance;
• imaginatively designed homes with gardens in healthy, vibrant communities;
•generous green space linked to the wider natural environment, including allotments;
•strong local cultural, recreational and shopping facilities in walkable neighbourhoods; and
•integrated and accessible low-carbon transport systems.

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[1] Nicholas Falk and David Rudlin, Uxcester Garden City, URBED 2014 www.urbed.coop
[2] Town and Country Planning Association Creating Garden Cities and Suburbs Today, TCPA 2012

2 Innovative design features of the Eco-Houses

2.1 SCAD Eco Housing will aim to research and test out innovation in seven main ways (see illustrative drawings on page 2):

a. Maximum use of public transport, walking and cycling to help improve air quality and public health through location on transport corridors or near railway stations
b. Sanitation measures to minimise water wastage while improving health, for example through drawing water for non-drinking purposes from restored local 'tanks' , avoiding leaks, and processing waste products
c. Plots that enable subsequent extensions and improvements, including space for 'kitchen gardens' for healthier living, and lots of trees for natural cooling to avoid the need for air conditioning
d. Designs that response to local vernacular, such as terraced streets that support active communities, but that also provide space for contemporary needs: eg storage, toilets and waste disposal or recycling
e. Construction out of reused and natural materials, such as Hempcrete. This combines local lime with using the stems from growing industrial hemp for the clothing and motor industries. Hempcrete would reduce the high carbon emissions from the use of concrete and provide farmers with a cash crop assuming it met market conditions as well as options such as brick or fly ash. .
f. Use of 12/24 volt electricity from solar panels with mini grids and battery storage, and natural ventilation and insulation to reduce dependence on an unreliable electricity grid
g. ICT links, for example connections with the Internet or phone lines, to make communication easier and also to help distance learning.

2.2 In short the new 'eco homes' will minimise the consumption of scarce resources and would enable mid-sized cities such as Tirunelveli to grow without '*costing the earth'*. They will appeal to people moving out of villages into homes of their own, as well as to municipalities and utilities wanting a more sustainable alternative to urban sprawl. They can be built by small and self-builders, offering a much better alternative to crowded slums, and creating local employment. 'Eco-villages' will combine the capacity for traditional forms of housing to co-exist happily with the planet, while achieving the levels of aspiration associated with urban life styles and new technologies. For example mobile phone apps can be used to encourage healthier living and overcome the isolation associated with new settlements. A linked project will draw lessons and apply them in training students, for example through awards for group work.in producing essays on affordable homes, natural resources or hospitality.

2.3 The greatest value of the project will also come from its potential to be extended and to act as a model for other areas. The basic challenge in building sustainable homes anywhere is

providing advance infrastructure, such as roads and schools, which is where the growth of certain European cities offer many lessons. As infrastructure can cost as much as building new housing, it is important to make the most of what already exists. This includes not just transport but also energy and soft infrastructure such as hospitals and colleges. It is also important to minimise water consumption and waste, and to tap solar power to make new homes independent of unreliable state power sources, and make the most of natural resources.

3 Project management and capacity building

3.1 When Nicholas Falk last visited SCAD in February 2016, possible sites were identified for a demonstration project, and he was asked to fund an Essay Prize for groups of students in Engineering and Business. In August 2016 , SCAD confirmed their willingness to lead the Eco-Village project in an email stating:*'Mr. Nagarajan and Mr. Jayakumar Principal SCAD Engineering college will be overseeing the project and Dr.N.Nalanth from the Civil Engineering Department/Francis Xavier Engineering College,Tirunelveli will in charge for the day to day monitoring of the project.'* Since then Dr Nicholas Falk has been drawing on advice from experts in the UK to provide a brief, which can form the basis for an agreement.

3.2 It is suggested that the project manager should be chosen for his or her experience in urban development and interest in sustainability and innovation. At first the appointment may be part-time, and could be linked to doing some teaching or research into the various issues (see Appendix B for a possible brief) Entrepreneurial and communication skills will be key. He or she will liaise primarily with others involved in the project in SCAD, but will also make regular reports identifying issues that have arisen and areas where advice would be welcomed. The first step will be to come up with a project plan setting out an action programme with a timetable and budget. Agreement will also needs to be reached with an appropriate technical organisation, such as Anna University, to monitor and draw lessons from the project. It is hoped that as the project develops additional sources of funding can be tapped, and hence it will be important to show that results are being achieved.

3.3 Once the project manager is in place, further support will be made available in terms of technical assistance through URBED's new web site on Smarter Urbanisation, which is under development. Www.urbedtrust.org. Experts have been identified in the UK on different topics, who may volunteer their services. In addition URBED may be able to provide some support in terms of the design and layout of the demonstration project through an associate based in India, as well as architects and planners in the UK.

4 Further research
4.1 Discussions are ongoing in the UK on using the project for a **distance learning programme** that could be used by both practitioners and students. In the first instance relevant papers would be made available on the URBED web site. Our hope is to develop the Smarter Urbanisation toolkit in collaboration with The Prince's Foundation for Building Community (www.princes-foundation.org) and their PRU2030 programme, as well as with one or more university departments who have expressed interest, such as Oxford Brookes

University and the Oxford Institute for Sustainable Development. The ultimate aim is to devise, test out, and distribute a modular programme on the stages of planning and building sustainable new communities. This would build on approaches to learning that Nicholas Falk and Richard Simmons have been using in post-graduate courses at New York University in London (NYU) and at University College, London (UCL). A joint conference is being planned with the Urban Development Group (www.udg.org.uk) for Spring 2017 to bring academics and practitioners together.

4.2 Further work will be needed into **construction methods** that can use local materials, and minimise demands on both energy and water. A great deal of work has already been done on traditional and sustainable forms of construction in both India and the UK, for example by Intbau, who are strong in India (www.intbau.org) . An important early task will be to draw out principles from Indian experience, and similar initiatives, such as Auroville near Puducherry (www.auroville.org), as well as research by bodies such as UN Habitat and British universities.. This could be undertaken as a separate research project, for example by someone at SCAD, as continuity will be important, with support from experts in the UK.. It would supplement information provided in the new URBED Trust web site, and should enable appropriate suppliers and contractors to become involved.

4.3 It is possible as the project develops that **innovation** and some research elements may be supported through the UK's Department for International Development (DfID), and the Newton Innovate programme, which is targeted at India. Hence joint applications may be developed with English universities that are keen to help, such as the University of the West of England (UWE) at Bristol, where Nicholas Falk holds a Visiting Professorship. Use might also be made of an architectural competition to stimulate innovative solutions from designers in Britain as well as India..

4.4 A final key issue s to be investigated is **implementation**, and how subsequent phases of development can be funded and organised without the delays and waste that have held back growth, such as corruption. This could include some form of 'rent to buy' and the involvement of an appropriate insurance company or other financial institutions. It might also involve setting up some form of public-private-partnership or development corporation. This might be a joint venture with the state water company or local authority, and could draw on experience in Europe, as well as case studies of land value capture undertaken by the World Bank.[3] Here it will be important to learn from previous failures as well as successes in project management, and support may be available from the Royal Institution of Chartered Surveyors (RICS), who are active in India.

Dr Nicholas Falk, December 14th 2016
Chair, The URBED Trust, The Building Centre, 26 Store Street, London, WC1E 7BT

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[3] Hiroaki Suzuki et al, Financing Transit-Oriented Development with Land Values, World Bank Group ,2015

Appendix A

A Possible Framework for Smarter Urbanisation

One possible solution to the problems of financing housing development lies in **sharing** in the value of land value uplift from development, (which is favoured by the UN and the World Bank). Some of the surplus can then be invested in better local infrastructure for the local community as a whole. This might involve any or all of the following eight ingredients which are set out a basis for subsequent discussions with other stakeholders or partners:

1. Starting in places with real economic growth potential (which means availability of skilled personnel and good transport links with jobs in growing urban areas
2. Identifying locations on under-used railway lines (including those that are being rebuilt) that lie near railway stations or halts, and that are in public ownership
3. Selecting sites that are not in flood plains (and hence more suitable for agriculture), and that can be connected economically to utilities, especially water, as this is the key resource constraint in India; incidentally the main water supply line and other services might well be laid next to the railway in a common **duct t**o make incremental development easier
4. Negotiating with the site owner, such as the State railway company, to prepare development plans subject to the owner receiving a share in the eventual development value (sales or rentals). 10% might be an appropriate level for land with no immediate prospects for development, and 20% for land already identified in plans
5. Setting up a joint venture or subsidiary company with the water company to install basic infrastructure and sell of serviced plots; such a company might secure funding from an institutional investor and/or the World Bank or other public funding sources
6. Collecting the revenue either from the sale of plots with planning permission, or from rentals on the housing built on the plots (possibly with a 'rent to buy' agreement in which the occupants build up equity in return for paying the rental regularly; the local authority might be incentivised to participate in the board of a development corporation, possibly using the model of London Docklands as a prototype
7. Providing an incentive to the water company so that water rates would be levied on houses (and other users as 70% goes to agriculture), possibly with an agreement in which a standpipe would be provided 'for free', but connections would be controlled and metered. In this way housing could be valued with or without water connections, and money collected, thus satisfying any financial institution that participated.

8. Using water supplies to irrigate crops and trees, possibly using the kinds of micro systems used in Israel and Australia, where water is scarce. Water meters and related pumps might well be funded as an experiment linked to university research, and then leading onto some kind of manufacturing joint venture with a UK water company, or a body like WaterAid (www.wateraid.org.uk) , which is supported by the water industry.

Scaled up, and incorporated in the Indian equivalent of '*garden cities and villages'* the Eco Village would offer a much more sustainable alternative than the current practice of building large concrete apartment blocks or isolated detached houses in the country. They could develop under-used land owned by Indian Railways, and support improved local rail services, thus taking pressure off over-loaded roads. An initial study has identified potential sites that could make use of land that is not suitable for growing food, and that might benefit from efficient new water connections. In that way the Tamil Nadu State Water Company could secure a better return on investment, and contribute to better strategic land use planning. Indeed appropriate urban extensions could plough part of the value from development back into improving the quality of life for all. This would offer people in growing cities a better vision for urban life that would help to break down the divides between town and country
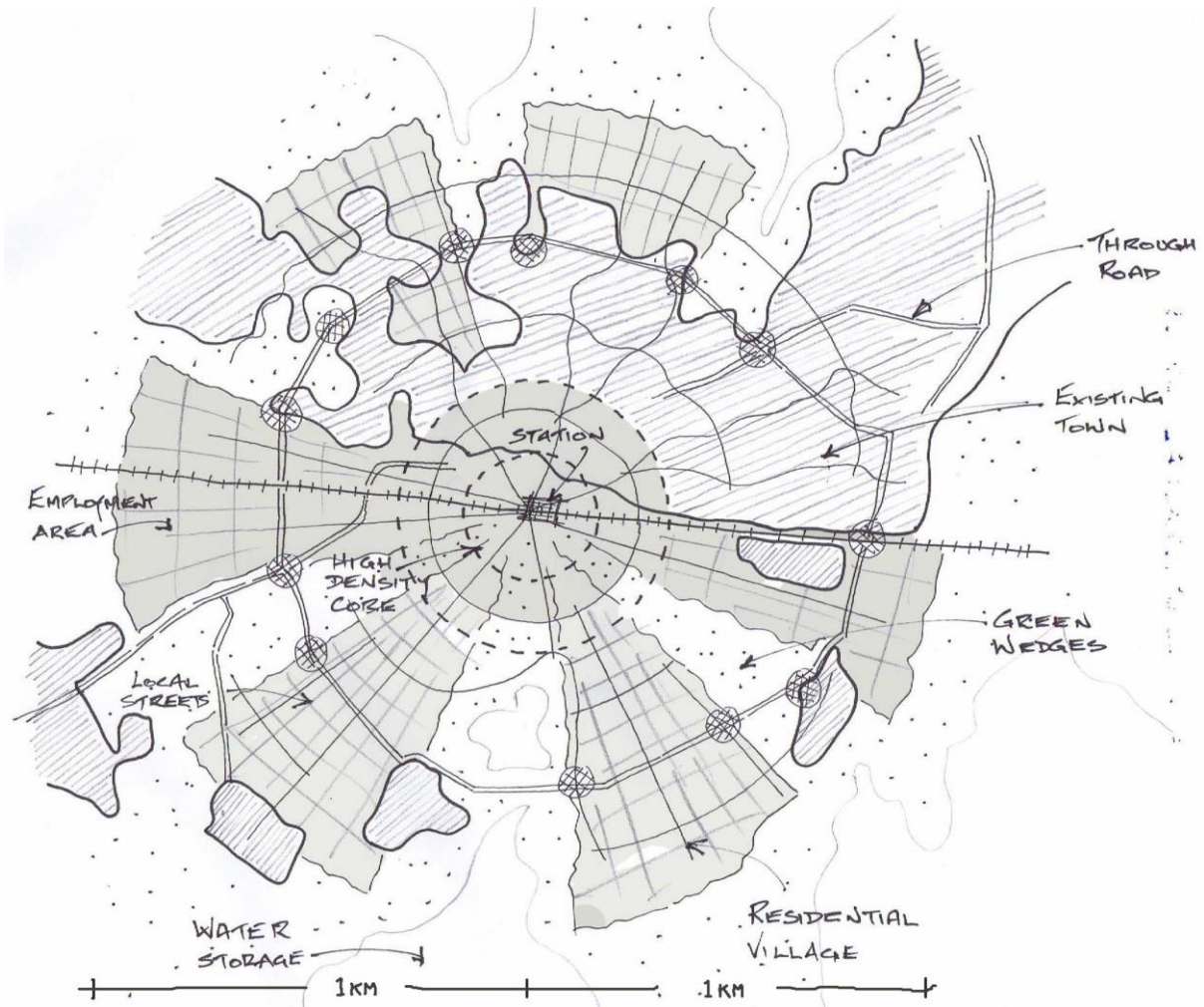
Sketch Plan of Proposed New Settlement around Pettai Station. Existing town shown hatched, new employment areas dark grey and new residential neighbourhoods light grey. Densities close to the station might be four or five stories, and two to three stories further away.

Appendix B

Eco Housing and Smarter Urbanisation
Key tasks for the Project Manager and issues for investigation

The role of the project manager is to research, commission and then build a demonstration project of five houses that could act as models for the growth of medium sized cities. The project will be locally managed, drawing on proven practice wherever possible, and will evolve as experience is gained. The tasks might then be split into two or three stages, to allow for the time involved in agreeing the best sites for testing the ideas out, and securing support from other stakeholders apart from SCAD, so that the project can be scaled up. Here are some suggestions for what the key tasks might involve:

First stage
  1. **Research and feasibility**

As a great deal of work has been done both in India and around the world on building affordable housing, and also on reducing environmental impacts, the project manager or a researcher should:

  a. Establish local practice, and where it can be improved
  b. Review what is known in India about ways of producing 'eco houses' that save natural resources
  c. Discuss requirements with potential occupant groups: eg young married couples, staff working for SCAD, visitors
  d. Propose who will occupy the prototype 'eco houses', and how they can be engaged in the process.

The research should lead on to a feasibility study to:
  e. Identify where innovation will be required
  f. Assess experience with key forms of innovation proposed
  g. Secure support from key stakeholders: e.g. SCAD, the municipality, builders and developers
  h. Prepare the first version of a financial model, showing the likely costs and income if the houses were sold, and the likely results if the project were undertaken on a much larger scale.

As well as drawing on books and web sites, advice might be sought from innovative architects, such as Anupama Kundoo, who has worked on projects at Auroville near Puducherry, as well as followers of leading vernacular architects, such as Laurie Baker and his work in Trivandrum with brick houses. Some of this work could be linked to the URBED Essay Prize, and could be broken down into topics such as those listed below. Use can be made of experience in the UK and elsewhere with building affordable and sustainable housing, for example through INTBAU (www.intbau.org) , and ongoing work by The Prince's Foundation to develop a toolkit. It may also help to apply the principles of One Planet Living www.bioregional.org.uk . Some assistance will be available, such as relevant research, via URBED's new web site www.urbedtrust.org

Nicholas Falk is committed to helping draw the conclusions together in a form that will help raise further funding and support from a range of experts in response to questions raised by the project manager.

2. **Site acquisition and funding**

Several possible sites have been identified, such as near the Bio-Digestion plant and entrance to the Cheranmahadevi campus, and at the Gypsy or Salt Villages where SCAD is working. Tasks for the project manager will include:

   a. Work out the amount of space required
   b. List factors for selecting appropriate sites for the demonstration project(s) eg transport and other services, visibility, availability
   c. Assess a limited number of potential sites
   d. Identify where the project might later be replicated
   e. Establish the infrastructure requirements for the project, based on what is available already on site and what needs to be provided
   f. Establish what elements might attract funding either as grants or loans
   g. Prepare a feasibility study to show that the costs can be covered from the available funding
   h. Liaise on drawing down funds as the project progresses.
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Second stage

3. **Planning and design**

The development of the prototypes could be undertaken in a number of ways, for example as a training project for students, or by securing bids from local builders. Designs might be the subject of a limited competition, having identified architects or engineers with appropriate experience and commitment. Negotiations will be required with the relevant authorities to secure permission, and as the project is intended to be experimental their collaboration will be important. Whatever method is chosen, a budget will be needed to cover

   a. The project team e.g. architect, engineer
   b. Specialised consultants e.g. energy, water
   c. Labour
   d. Materials
   e. Fees and approvals
   f. Feasibility study production.

4. **Construction**

Once there is an agreed design, the project will need to be implemented in stages, so that lessons are learned from the first prototype. Ideally the designs will be compared with conventional houses, and form part of a larger development. It may be best to go for some form of 'design and build' contract in which the drawings are handed over to a builder prepared to take full responsibility. Some of the houses may comprise little more than 'site and services', with a basic unit to be finished off by the occupier. It is envisaged that the units will be designed to be independent of energy and sanitation systems, though connections may be provided if the demonstration project is on land made available by SCAD. The work will include:

   a. Secure quotations for the main elements and different construction options
   b. Work out timetable for building a prototype and then subsequent houses
   c. Agree terms for obtaining the land

    d. Agree procurement methods and funding.

5. Letting and management

Decisions will need to be made on who is to occupy the completed houses, and whether they will be sold off or rented, or perhaps made available through some form of Rent to Buy arrangement, with income ploughed back into a further stage. This will include discussions with appropriate financial institutions to ensure that the lessons from the demonstration project can be applied on a larger scale. Tasks will include:

    a. Promotion
    b. Legal structure for ownership and/or renting, including ongoing liabilities
    c. Tenant selection
    d. Collection of rentals or other payments
    e. Maintenance of the houses and common parts

6. Monitoring and evaluation

As the project is intended to test out solutions to the challenges facing many growing cities in India, it is going to be important to monitor the project from the start. This will include the lessons learned at each stage, and to be done objectively and in ways that will influence public policy, requires relevant expertise and the involvement of a reputable university. This might form a joint project with a British university to help in sharing the lessons as widely as possible. A major part of the research will be to relate the lessons from the pilot or demonstration projects to the possibilities for scaling the project up as part of the Smart Cities or other government initiatives . Here the involvement of national institutions such as the RICS could be most helpful. The elements to be evaluated might include:

    a. Construction costs compared with conventional methods
    b. Costs in use: e.g. energy, water
    c. Construction and maintenance problems
    d. User satisfaction
    e. Affordability
    f. Financing.

Issues for investigation

Some of the topics to be explored as the project progresses include

    a. Construction
- Appropriate materials for construction, such as the feasibility of using fly ash, lime dust, and 'rammed earth'?
- Potential for growing and using the stems (chevs) of industrial hemp in 'Hempcrete' (www.ukhempcrete.com)
- The acceptability of alternatives to concrete by both builders and occupiers?
- Feasibility of making use of other agricultural waste products such as bamboo, palm leaves and straw?
- Scope for improvement, extension and customisation by the occupants?

    b. Planning

- Sites available close to railway stations but not used for agriculture?
- Potential for using land owned by Indian Railways?
- Support from stakeholders for the 'garden city' concept?
- Conformity with existing plans and Smart City projects?

c. **Design and construction**
- Density in relation to site area?
- Brief covering layout, number of storeys, occupants?
- Provision for self-build and adaptation?
- Landscaping (with trees to provide cooling)?
- Access?

d. **Energy and communications**
- Economics of solar panels?
- Storage systems and mini grids?
- Renewable electricity only?
- Cooking?
- ICT connections?

e. **Sanitation**
- Water supply?
- Toilets?
- Waste water?
- Other waste?