CHAPTER 6

CONCLUSION, SUGGESTIONS AND RECOMMENDATIONS
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6.1 Conclusion

Gated Communities have emerged as popular housing destinations for families mainly from the IT/ITES and more-well endowed sectors. They are located generally in the suburban areas of the Third Ring Planning districts of the Bangalore Metropolitan Area. They are privately developed by real estate developers/promoters. They are sought after by families who perceive them to be safe for their children and the elderly as also for their considerably superior amenities including the green infrastructure assets of the community.

There has been much controversy regarding the use of the term gated community as well as the legality of their perimeter walls, all in the media. Gated communities are legally sanctioned as group housing schemes by the Bangalore Development Authority. The private developer submits a development plan which is verified for conformity to the bye-laws as per the Land use Zonal Regulations of the RMP – 2015. The development plan shows the location, site layout, rainwater harvesting detail, location of the electric transformer, overhead tank, sewage treatment plant etc. It also contains the statistical calculations pertaining to site area, built-up area, FAR, ground coverage etc. Since the gated communities are located, at least initially, in suburban locations with no surrounding urban development the perimeter wall is a functional as well as a perceptual necessity. The perimeter walls primarily ensure safety for the residents of the community, delineate and define the gated community’s area and extent, regulate ingress and egress to specific points located on the existing trunk infrastructure and along with the community’s gates establish the resident community identity.

The aim of this research was to study the development and maintenance of green infrastructure in the privately developed gated communities in the Bangalore Metropolitan Area. This study was made using data from secondary sources as well as primary sources including the selected few gated communities.
Historically the green infrastructure in the gated communities has been initiated and developed as a part of the site development process by the private developer or promoter of the gated community. The private developers commissioned professional consultants including planners, architects, engineers, urban designers and landscape designers for the planning, design and development of the gated community. Later, after the residential units have been occupied by the respective owners and the resident welfare association (RWA) was formed the responsibility of the development and maintenance of the green infrastructure assets of the community was assumed by the Resident Welfare Association.

The Bangalore Development Authority had sanctioned 96 residential group housing development plans from July 2000 to March 2011. Since such developments are located in the Third Ring Planning districts which are suburban areas and they are developed as gated communities by the private developers to attract rich buyers as well as for reasons of security.

The site area as per the byelaw in RMP 2015 has to be greater than 20,000 sq. mt. for consideration as a group housing project. In terms of size based on site area the smallest gated community studied was Sobha Amethyst Sobha Amadeus with a site area of 28,110.42 sq. m and similarly the largest gated community was Sobha Althea Sobha Azalea with a site area of 1,45,641.17 sq. m.

The developers of the gated communities initially developed the parks and other open spaces like playgrounds in the gated communities. The visual survey identified the prominent green elements which are also the green infrastructure assets of the community of selected few case-studies. Trees are the most frequent green infrastructure assets. Peripheral trees planted in the set-backs serve as a good visual definition or demarcation of the site boundary. The internal streets of the gated communities have avenue trees which provide shade and visually characterize or define the internal site connectivity system. Trees also constitute visual barriers for activity spaces which require visual privacy like swimming pool areas playfields for the recreational needs – both passive and active- of the people. The environmental quality and the visual ambience of the open spaces have been enhanced by bowers as areas shaded by trees and other plants or as places enclosed by hanging boughs of trees. Topiaries and trellises covered with vines or arbours with flowering vines are
also used to add aesthetics to the open spaces. Shrubs are used to divide and define spaces. Seasonal flowering plants have been judiciously planted in the open spaces and parks in such a way that there are some flowers throughout the year i.e. during all the seasons. Lawns are laid in parks and serve as passive recreation space as well as lend considerable visual attraction through its colour and texture. Incidentally, lawns are used in the berms that separate the internal streets from individual homes as well as in the spaces between homes.

The internal streets of the communities provide opportunity for avenue plantations which are also the green infrastructure assets of the community. The mandatory setback areas in addition to providing space for visitors parking in some communities also function as open spaces for the development of the community’s green infrastructure assets. In yet others, they facilitate the development of jogging and cycling tracks.

The vegetation and landscaping of the gated communities reveal that the green infrastructure was effective in the reduction of the urban heat island effect as opined and expressed by the community members.

The sporting facilities include tracks and trails for jogging and walking which also serve to link and unify the various areas and activities of the gated community. The internal streets of the gated communities also serve as cycling tracks mainly for the youngsters who choose to make use of the facility mainly in the evenings and non-school hours. Tennis courts, basket ball courts are the other sports facilities found in the gated communities and these are in the mandatory park and open space area as per the existing bye-laws and constitute 10% of the site area. These areas are demarcated by shrubbery and trees and vines are used to aid privacy in such spaces. The use of vegetation also significantly contributes to the environment and enhances the scenic ambience. These spaces are mainly used in the early morning and evening hours. The other outdoor recreational and sports facilities found in the gated communities are the swimming pools. Shrubbery is effectively used to demarcate as well as ensure privacy for the swimming pool areas.

The housing types include villas, condominiums, row-houses and apartments. Irrespective of the housing type the initial development of the community’s green
infrastructure was undertaken by the developer or promoter of the community and its subsequent maintenance by the Residents Welfare Association. In gated communities with apartments due to the reduced coverage there was more open space for greenery rather than in those with either villas or row-houses.

Design themes that appear to have a distinct impact on the visual aspects of the gated community’s green infrastructure are usually based on evoking images of exotic foreign landscapes. This imagery is partly brought out in the built form but mainly in the choice of elements of landscape including the most visible elements of green infrastructure namely trees, shrubs, trellises and other plant material. There is a considerable effort which is visible on the part of the landscape architects and designers at using native plant types which look like their foreign counterparts as the native types are hardier and better adapted to the local climatic conditions.

Water is critical for the development and maintenance of green infrastructure. It is interesting to note that rain water harvesting is being carried out by all the gated communities and the rain water harvesting pits and collection ponds are appropriately located in the park areas and are designed to be part of the park landscaping scheme.

It was interesting to note that waste water recycling is actively done in the gated communities. The treated waste water or grey water is piped and used for washing the vehicles and pavements. Water is a primary resource for developing the green infrastructure assets of the gated community. The recycled waste water is also used to maintain the gated communities’ green infrastructure assets in the gated communities.

Waste water treatment plants are present in all the gated communities. An interesting observation has been the presence of grey water spouts and outlets, duly marked, in the open spaces and parking areas. This water it was observed has been used mainly to maintain the green infrastructure assets of the community.

Gated communities are privately developed and located in suburban areas that initially lack the needed and expected urban development. The physical infrastructure for storm water management is designed and executed by the private developer as a part of the development package for the community. The storm water was usually drained off into the closest water body which may not be within the gated community site. As the surrounding areas get urbanised the trunk infrastructure for storm water management
is built by the municipal authority namely the Bruhat Bangalore Mahanagara Palike. The lack of synchronization in storm water management infrastructure of the privately developed gated community and the trunk storm water management infrastructure of the municipal authority can lead to unpleasant situation including blocking of the gated community drains by the municipal authority. This results in poor environmental conditions within the gated community due to the stagnant water causing physical distress as well as unhealthy conditions. The range of possible solutions to overcome the situation would first of all start with its initial anticipation and concurrence and consultations with the municipal authority during the design and engineering phase of the community, draining of rain water into rain water harvesting ponds located in the lower contours of the community itself and designing them to be a part of the landscape of the community and using a combination of bio-swales and rain water harvesting ponds. Ideally the storm water needs to be conserved within the community itself and used for maintaining the green infrastructure assets.

Since the gated community comprises of highly qualified, affluent, upwardly mobile individuals and families there is expectedly a great sensitivity towards waste management. The domestic waste is segregated at source into bio-degradable, non-degradable components and stored in appropriately color-coded garbage bags. The segregated waste is collected from individual homes, stored at the community level and disposed off in garbage disposal trucks. In a few cases the garbage is collected by specialist contractors for conversion to manure at ex-situ sites. Colour-coded mobile garbage bins have been placed in those areas where people are likely to gather in the open spaces as well as in the basement and stilt-parking areas. These are conveniently used by the community households. The resident welfare associations hire trained staff for the maintenance of the common areas of the community including the waste management.

Gated communities are classified as bulk generators and the BBMP mandates that bulk generators are responsible for their own solid waste management. The solid waste management of the gated community thus becomes a comprehensive, combined effort of the entire community. Families classify the waste at source primarily into wet and dry waste. The wet waste, mainly kitchen waste, along with other organic waste of the community like the garden waste is composted at site in some communities. The
BBMP encourages the establishment of a community level bio-gas plant. The dry waste is collected at community level and is disposed off with the help of waste disposal agencies for a price. There are several community level initiatives, formal as well as informal and spontaneous, that encourage the residents of the community on the three R’s of waste management, REDUCE, REUSE, RECYCLE.

Most gated communities in Bangalore depend on bore-wells for their supply of water. Water supply is yet another area where the situation and scenarios need to be anticipated at the development, design, engineering and construction stages of the gated community by its private developer. There has to be a consultation with and concurrence with the BWSSB officials for managing the water supply to the gated community.

The gated communities being located in the relatively distant suburbs the connection with the sewerage system of the community to the general city sewerage system has not been possible. The communities have their own system of soak-pits and septic tanks for sewage disposal. These are appropriately and discretely located in the open space areas of the community. There have been instances of specialist agencies dealing with sewage treatment, management and maintenance of soak-pits and septic tanks and conversion of soak-pit and septic tank residue into precious manure which becomes a resource for nurturing the green infrastructure assets.

All the six gated communities are located in the suburbs and are remote from the city sewerage network. The sewage generated by the community is treated in-situ and the sewage treatment plants are appropriately but discreetly located. In some cases it appears as if the sewage treatment plants are located in anticipation of a future connection to the larger city sewerage system.

The private developers of the gated community have to develop the sewerage infrastructure for the community. The development of the sewerage infrastructure has to be in consultation, concurrence of the Bangalore Water Supply and Sewerage Board (BWSSB) who will ultimately extend the city-wide sewerage system as the area urbanizes. The private developer should anticipate future connections to a city-wide sewerage system in establishing the community’s sewerage system and more specifically in the location of the sewerage treatment plants (STP) in the lower level
areas of the gated community. The sewerage system of the gated community was
developed by the private developer or promoter in the selected few gated communities.

The gated communities by virtue of their suburban and non-dense location have an
opportunity in exploring alternative sources of energy. Solar energy has been explored
for lighting the open public spaces of the community as also for heating water by using
solar water heaters. The gated communities are generally located in pristine
undeveloped locations and there is definite possibility of exploring wind energy
especially because of the open spaces in the community which allow an unhindered air
movement or wind.

With respect to the existing planning regulations and guidelines, Gated Communities
are sanctioned by the Bangalore Development Authority as per the Zoning and Land
use Regulations, Volume III of the Revised Master Plan 2015. They are classified as
Group Housing (Development Plans). A residential development plan is defined as,
“Plan containing proposal for construction of one or more residential buildings on a
plot measuring more than 20,000 sq m in extent.” All the gated communities studied
were greater than 20,000 sq m in area.

As per the byelaw “10 % of the land shall be reserved for Park & Open space. The
open space (park) shall be relinquished to the authority free of cost and the same may
be allowed to be maintained by the local residents association (registered), if the
Authority so desires.”

In compliance with the bye-law of the Land use Zoning Regulations of RMP 2015
10% of the total site area has been developed as park for recreational purpose in the
gated communities. In some gated communities this area is fragmented into small park
spaces and distributed across the gated community whilst in others it is concentrated
and developed as a single large open space. However, it is noted that there is ease of
public access in both the cases. In some of the case-studies out-door sports facilities
like tennis and basket ball courts are provided.
There are no regulations pertaining to the construction of the perimeter wall. The perimeter walls are constructed to ensure safety for the residents of the community in the suburban location. They delineate and define the gated community’s area and extent, regulate ingress and egress to specific uniquely identifiable points located on the existing trunk infrastructure and along with the community’s gates establish community identity. The perimeter walls are more of a perceptual and functional necessity.

As per the byelaws “Roads as shown in the Revised Master Plan 2015 shall be incorporated within Plan and shall be handed over to the authority free of cost” The responsibility of creating trunk infrastructure as per RMP 2015 lies with the developer and the same has to be handed over to the authority. This has been complied with in all the gated communities.

Rain water harvesting is mandatory as per the Zoning of Land use and Regulations of the RMP 2015 for the BMA. The development plan submitted to the Bangalore Development Authority by the developer/promoter of the gated community has to show the proposed rain water harvesting details. As part of the site development process the rain water harvesting pits have to be located to facilitate the surface drainage for an effective storm water management. In some communities rain water is harvested and collected in ponds integrated into the community’s landscape and as a part of the mandatory 10% site area for the parks and open spaces. Rain water harvesting ensures water for the maintenance of the community’s green infrastructure assets. The harvested rain water was used predominantly for maintaining the green infrastructure of the community in all the case-studies. The water collected is also redirected to a deep pit with percolation.

Finance is required for the development of green infrastructure. The initial cost for the development of the green infrastructure is borne by the private developers. The green infrastructure of the communities was planned and developed by the private developers. Special attention was given to landscaping as this fetches a higher selling price for the developer. The cost of development of green infrastructure has been added into the selling price by the developer. Subsequently, the residents themselves generate funds for the development and maintenance of the community’s green infrastructure assets. The green infrastructure assets have later been maintained and
augmented by the respective resident’s welfare associations. The residents bore the cost of maintenance and augmentation of the green infrastructure by paying an amount on a prorate basis of their residential units’ built-up area.

The peoples’ efforts at augmenting their community’s green infrastructure assets have departmental as well as institutional support. The Karnataka State Horticulture Department along with the Bangalore Mahanagara Palike offers horticultural services to the citizens. The BMP has 12 small nurseries located in the three zones, East Zone, West Zone and South Zone and a large nursery in Bommanahalli. People can procure saplings from the nursery in their zone.

In the selected few gated communities the respective Resident Welfare Associations were active in maintaining and enhancing the green infrastructure assets of their community.

The selected few gated communities promoted green infrastructure through contemporary design elements. The most common element was the parks with lawn serving as visual amenity and enhancing environmental aesthetics. Such spaces also served as passive recreation spaces. The other interesting element was the berms with lawn to separate the circulation areas from the individual houses. Open jointed stone paving to allow water percolation through the joints and at the same time provide an impervious surface for walking was used extensively and the variation in texture and colour of the stone and grass was visually appealing. The area of the gated community was traversed with jogging and bicycle trails defined and shaded by vegetation including trees and shrubs. Avenue trees for shade as well as visual definition along the internal private streets lent considerable character to the gated community. Peripheral Trees for visual definition of the site boundary contributed significantly to establishing community identity. Shrubs and lawn in the open space between the houses lent privacy and enhanced visual aesthetics of the community. Trees and shrubs were used as visual barrier for areas requiring visual privacy like the swimming pool and sports areas. Waterways for visual relief as well as an input for improving microclimate were restricted to a few gated communities only.
The conservation and development of the green infrastructure originally created by the private developer is of paramount importance. The privately developed gated communities are located mainly in the suburbs and access to the developed parks therein is almost seldom for the general public. Therefore the onus of developing green infrastructure assets of such communities is entirely on the private developer and once developed its maintenance is the responsibility of the Residents Welfare Association. It is obvious adequate open space for both recreation and rest is a vital element in maintaining and improving the health of the people of the gated communities. The Resident Welfare Associations of individual gated communities come together at Swabhimana, platform of NGOs and resident groups in Bangalore. They can maintain their community parks on similar lines as Udyana Mithra, wherein the neighborhood parks of Bangalore are maintained through Public Participation of Residential Welfare Associations and BBMP under joint venture. The Resident Welfare Associations can encourage participation of community members on similar lines to Udyana Haasiru which is an effort to rebuild, strengthen and enhance the “Garden City” image of Bangalore and revive its landscape heritage by kitchen garden development, terrace gardening, providing training and conducting exhibitions for preservation of trees, by supplying avenue saplings and fruit plants to the citizens. The gated communities can exhibit their green infrastructure assets through events like Ritusamhara, a year-long programmed show of sequentially blossoming trees in the community.

The stake holders of gated community development are the clients, developers/promotors, professional consultants including planners, urban designers, architects, landscape designers, engineering consultants, construction teams and last but not the least the development authority which is also the sanctioning authority. In conclusion of this research work, the following are the suggestions for the various stake holders as well as recommendations for the development authority
6.2 Suggestions

6.2.1 Suggestions for Private Developers of Gated Communities

Gated Communities are developed by private developers or promoters and cater to the housing needs of families with significant disposable incomes. The following are suggestions for the private developers of the gated communities.

- It is suggested that a green infrastructure plan be included along with the development plan as a part of the requirement for the sanction process. The green infrastructure plan should show the existing contours, site vegetation and other site features along with the modifications to the same due to the residential development. It should clearly highlight those site features that have been conserved and distinguish from the green infrastructure proposed to be created.

- The 10% mandatory open space for parks and playground should be clearly demarcated from the other open spaces like courtyards etc which are associated with the buildings. Public access to the parks and playground should be clearly indicated.

- Storm water drainage, sewerage system including soak-pits and septic tanks should be clearly indicated. The drainage system should be designed bearing in mind connections to a public drainage system as intended for the future. Location of rainwater harvesting ponds and recharge pits should be according to the site’s contour topography.

- Solid waste storage area before disposal along with in-situ disposal measures, if any, should be clearly indicated on the green infrastructure plan.

- An inventory showing the existing green infrastructure assets before the development should be made. Measures to conserve the existing assets as well as to augment them should be indicated. A similar inventory showcasing the green infrastructure assets to be designed and created should be a part of the green infrastructure development plan.
6.2.2 Suggestions for Professionals

Gated communities are designed developments and the design teams include professional urban planners, urban designers, architects landscape architects and interior designers. The following are suggestions for the professionals involved in conceptualizing and designing gated communities

- It is suggested that the designers of the gated communities specifically address two complementary urban design components that help enhance the viability of green infrastructure namely less paving and more vegetation including water absorbing areas.

- Site planning measures which can avoid unnecessary paving or reduce it include:
  
  - Density zoning: Specifically in gated communities high-rise, high density development ensures that the ground coverage is reduced leaving more open space for the development of green infrastructure. It is also quite possible that persons seeking to own residences/sites in a gated community want only one or two storied houses and do not want to live in multi-storied complexes and high-rise apartments.
  
  - Cluster development: Placing several housing blocks together surrounded by open space gives more opportunities for the design and development of green infrastructure.

  - Street design: Street widths should be just adequate for the community’s traffic, must be designed to reduce the tendency to speed and must include opportunities for the development of green infrastructure including avenue plantations, berms etc.

  - Site features such as turn a-rounds, features for preventing physical access but permitting visual access could be viewed as opportunities for developing the community’s green infrastructure assets.
Bio-swales could be considered for storm water drainage. A bio-swale is a linear planted drainage channel which may be grassed or vegetated. The gentle incline of the bio-swale ensures that the storm-water runoff moves as slowly as possible. This allows the rainwater to remain on the site for a longer period of time allowing it to soak into the ground. The bio-swale drains into a more conventional storm water drain at the lowest point across a raised inlet. The bio-swale performs percolation and infiltration functions along with cleansing the runoff through the plants and soil microbes. And sewage and possible other toxic contaminations have to be strictly avoided.

The use of porous paving material is suggested. The porous paving material allows infiltration to occur through its surface itself. Typical porous paving materials include grassed pavers and unit pavers.

Vegetation is the chief element of green infrastructure. It is suggested that the landscape architects specifically address the issues of vegetation including the types of trees, shrubs, vines, lawns.

It is suggested that native plants be used as they are more sustainable because they are adapted to local geo-climatic conditions. They enhance biodiversity as they attract birds, butterflies and small fauna being a source of food for them. Native plants are effective in formal plantings such as street trees, hedges and green walls. Their most appropriate uses are as communities of plants and plant ecosystems such as the xeric communities recommended for eco-roofs.

The use of green walls is suggested. A green wall is a vegetated surface which suits many functions and aesthetic preferences. It deadens and diffuses noise, renders graffiti impossible, cuts heat and glare, holds or store rainwater, traps air pollutants and processes carbon dioxide. The green wall also provides food and shelter for life forms enriching the biodiversity of the precincts.
The use of eco-roofs is suggested. Eco-roof typically covers the entire roof of a building. It consists of a thin layer of growing medium which supports low maintenance vegetation. It does not permit physical access.

Where physical access is found to be necessary conventional roof gardens are suggested. Roof gardens also enhance visual delight and function as passive recreation spaces in the neighbourhood.

Water is most essential for vegetation. It is suggested that the designers plan for rainwater harvesting in such a way that the rain water harvesting ponds are integrated with the landscape and provide a visually pleasing environment.

It is suggested that the planners of the community plan and develop the infrastructure for the use of grey water and treated effluent keeping visual aesthetics as a priority in addition to the functional necessity of using such water for the maintenance of the community’s green infrastructure assets.

6.2.3 Suggestions for Resident Welfare Associations

The green infrastructure assets of the gated community are managed and maintained by the community’s Resident Welfare Association. The following are suggestions for the Resident Welfare Association members specifically responsible for the management and maintenance of the green infrastructure assets of the community.

- The use of grey water, treated effluents, and harvested rainwater is suggested for the maintenance of the community’s green infrastructure assets.

- It is suggested that the choice of native plants be prioritized as they are better adapted to the local conditions.
6.2.4 Suggestions for Gated Community Members

Last but not the least, the green infrastructure assets of the community is meant for the benefit and source of fulfilment for the community members. The following are suggestions for the community members who are the beneficiaries of the green infrastructure assets.

- It is suggested that the community members actively participate in the maintenance of their green infrastructure assets with focus on civic sense; and strongly discourage damaging the green infrastructure. Intended, unintended or inadvertent vandalism especially by the activities children and unthinking youngsters has to be avoided, if possible systemically.

- The finances for the maintenance and management of green infrastructure assets of the community have to be generated from the community members themselves on a pro-rata basis with respect to the size of the housing unit owned. It is suggested that the community members diligently make payments to the Contingency fund from which the amounts are expended towards the maintenance and management of the green infrastructure assets of the community.

6.3 Recommendations

The developer/promoter of the gated community has to prepare the development plan in accordance with the bye-laws and submits it to the Bangalore Development Authority which is the sanctioning authority. The following are recommendations to the Bangalore Development Authority with the expectation that the same be mandated as bye-law.

- It is recommended that a green infrastructure plan be submitted along with the development plan as a part of the sanction process. The green infrastructure plan should show the existing contours, site vegetation and other site features along with the modifications to the same due the residential development. It should clearly highlight those site features that have been conserved and distinguish from the green infrastructure proposed to be created. Or preservation of antecedent green endowments is required to be a priority.
• It is recommended that the Bangalore Development Authority addresses the issue of prescribing impervious surface limits as surface with soil or pervious surface is critical for the development of green infrastructure. A maximum percentage of the site area that can be made impervious or paved can be stated as a bye-law. The impervious area to include both paved ground as well as roof areas. In the same way pervious surface supporting vegetation can also be stated as a bye-law.

• It is recommended that the internal street widths be specified through bye-law. The streets should be wide enough for vehicular movement, on-street parking, foot-path, and should include width for the development of the green infrastructure including avenue plantation, street furniture, berms, and other landscape elements of aesthetic value.

• Tree planting maybe mandated through a bye-law specifying number of trees to the planted for a specified area.

• Types of trees may be mandated to include native species more adapted to the local environmental conditions and saplings made available through local plant nurseries.

6.4 Avenues for Further Explorations in the Research Domain

The experience gathered in this research work has opened up avenues of exploration and further research. The following is a brief account of the same.

This study of impervious in contrast with absorbing surfaces is important. The details about norms and their evolution have to be worked out. Proportion of these two types in individual land use norms – in small, medium and large private residential sites, multi-storied apartments, public buildings, industrial and business establishments etc. - have to be considered. Do these require differentiated rules? How are they being arrived at and enforced? The bio-ecological and technological bases for these are all interesting. And could be a good piece of research.
Trees are the most visible and key elements of green infrastructure. In addition to their aesthetic and environmental values they are also considered for their economic worth. This perception is very rational, relevant and appropriate. The basis of these quantifications, long term and short term valuations has to be attempted. Indian specifics have to be worked out as devices to assess contributions from possible green assets. Trees can be a regular and organised source of green manure, fodder and fuel; and have to be looked at in this possible perspective.

From the point of view of augmenting green endowments in a certain bio-geographic habitat, preference to sustainable local species of plants and animals is natural and obvious. But, there are biotechnology needs and these are being discovered and optimised; for example bio-detoxification of effluents. This entails resorting to raising of non-local species suitably and possibly hybridisation too. And these are matters of specialised bio-ecological-technological studies and research. And not immediately relevant here and may be taken up by students and other researchers.