

# Future skill needs in municipal engineering in Sri Lanka

Veluppillai Mohan MSc, CEng, FCIHT, FIE, IntPEng  
Project Director, Road Development Authority, Ministry of Highways,  
Colombo, Sri Lanka

**This paper addresses the challenges faced in municipal engineering management for sustainable development in Sri Lanka and identifies the need for improving the quality of life of low-income urban populations with the participation of relevant stakeholders. The paper also identifies the training needs for managing the identified challenges and assesses the municipal engineering management segment of local government. In Sri Lanka, there has been a long-felt need for the training of technical personnel with a view to building their capacity to manage future needs and cater for current demands at local authority level. The research and training division of the municipal engineering management section has recently carried out a fact-finding exercise to determine the nature of technical personnel associated with local authorities. This project has recognised the fact that existing staff skills in urban local authorities need to be strengthened in order for them to fulfil their role in municipal engineering management and to assume greater responsibilities in the profession of urban services. The training programme will enhance this particular segment of local government employee skills in municipal finance management, municipal engineering and environmental management.**

## 1. Introduction

The democratic socialist republic of Sri Lanka is an island nation in south Asia with a population of 20 million (Figure 1); it has been demarcated into nine provinces and 25 districts. Sri Lanka has an executive presidency elected for a period of 6 years by universal adult suffrage. Sri Lanka has a 225-member parliament, also directly elected for 6 years by a system of proportional representation. Extensive powers have been devolved to nine directly elected provincial councils and over 250 municipal councils, urban councils and *pradeshiya sabha* (local administration bodies). The current per capita income of Sri Lanka is US\$ 1617 (CBSL, 2011a) and from 2009 to 2011, economic growth had been around 5%. Sri Lanka will continue in general to pursue open economic policies and its attitude towards foreign investment will remain positive for several reasons, including environmental concerns. In 2007, the Sri Lankan economy recorded growth above 6% for the third consecutive year for the first time since 1948 (CBSL, 2008). There is a need to improve on the quality and productivity of municipal engineering management for sustainable development and decision making.

## 2. Municipal engineering management in Sri Lanka

Most Sri Lankan municipalities and urban authorities are struggling to maintain or renew aged and decaying infrastructure under current funding levels and with the present demand. They are also trying to deal with rapid growth in

public demand for high levels of service and increased exposure to liability and risk. The ministry of local government and the provincial ministry are primarily responsible for developing priorities and a long-term plan to assist in funding municipal infrastructure needs. Carrying out this mandate requires thorough knowledge of the scope of municipal infrastructure requirements (capacity building needs for rehabilitation, upgrading, replacement, expansion and new infrastructure) in both the short and long term.

Municipal engineering in Sri Lanka involves planning, programming, designing, estimating and managing the procurement process and the construction and maintenance of structures, buildings, roads, bridges, streets, signals, sidewalks, traffic signs, water supply networks, sewers, street lighting, municipal solid waste management and disposal facilities, storage depots for various bulk materials used for maintenance and public works (salt, sand etc.), public parks and bicycle paths. In the case of underground utility networks, it may also include the civil portion (conduits and access chambers) of the local distribution networks of electrical and telecommunications services. It can also include optimising garbage collection and bus service networks. The threat to urban populations (Figure 2) from epidemics of waterborne diseases such as cholera and typhus led to the development of a profession devoted to 'sanitary science', which later became 'municipal engineering'. Some of these disciplines overlap with other civil engineering specialities, but municipal engineering focuses on the coordination of infrastructure networks and services as

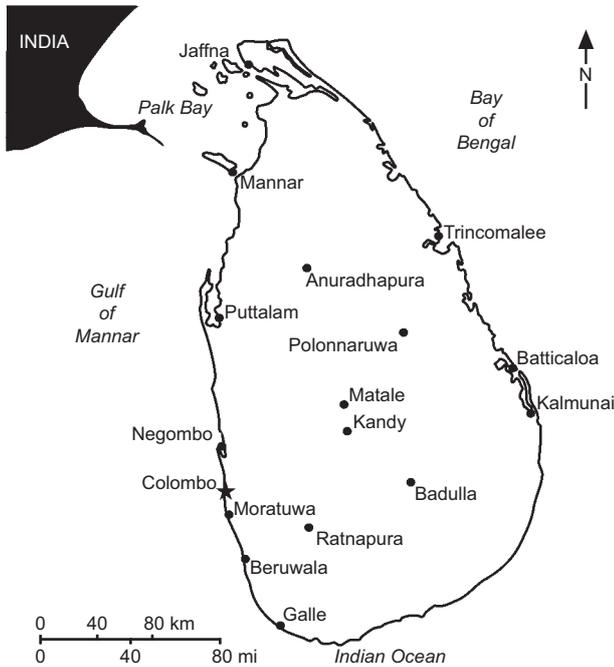


Figure 1. Main towns in Sri Lanka

they are often built simultaneously and managed by the same municipal authority.

### 3. The need for change

About half of the labour force in developing countries like Sri Lanka works in the informal sector, which includes home-based industries, taxi drivers, street vendors, food sellers and casual labourers. Planning regulations often discourage home-based industries that are not realistic and are an impediment to the goals of poverty alleviation and sustainability. However, municipal planning regulations should be reformed to incorporate sufficient flexibility to encourage acceptable types of home-based industries in tolerable places. Regulation should be able to encourage disciplined enterprise. Communities that are able to foster sustainable industries are successful.

The under-employed urban poor who have very little or no education or skills must be trained to fill the shortage of skilled and semi-skilled manual workers needed to build community infrastructure and houses and maintain deteriorating public works in order to improve quality of life. Empowerment comes through endowment of skills and capacity to build and maintain a community and its own liable environment. Skilled manual workers in south Asia also have the opportunity to work in other countries in the developing world, making skills training an asset for the poor, the local communities and the developing nations.

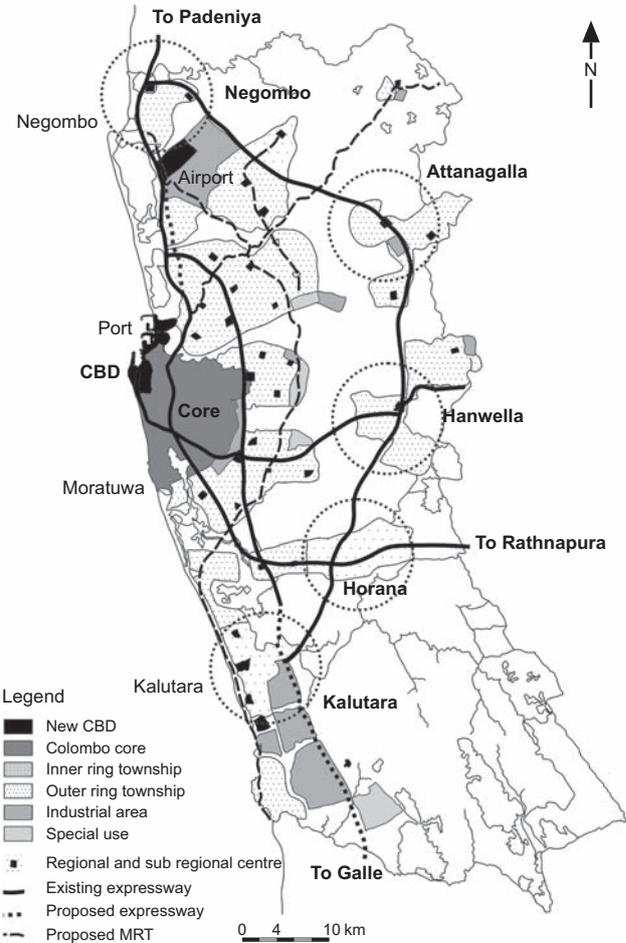


Figure 2. Future development plan in city of Colombo and suburb. CBD, Colombo-based development; MRT, metropolitan rapid transport

Community-based organisations, non-governmental organisations and other civil society leaders should mobilise self-help initiatives to utilise unemployed labourers for their own benefit. Increased levels of skills and education lead to increased ability to cope with change or in times of crisis and enhanced social capital to improve relationships and trust. Technical skills training, enterprise development, community participation and action against inadequate infrastructure are key avenues of poverty alleviation and should be addressed by the municipalities, urban councils and *pradeshiya sabha*.

#### 3.1 Municipal waste management

Municipal waste management has to be reorganised to facilitate recycling and reuse (Figure 3). In most cities in Sri Lanka, the municipal authority or its contractors collect domestic waste from high- and middle-income households

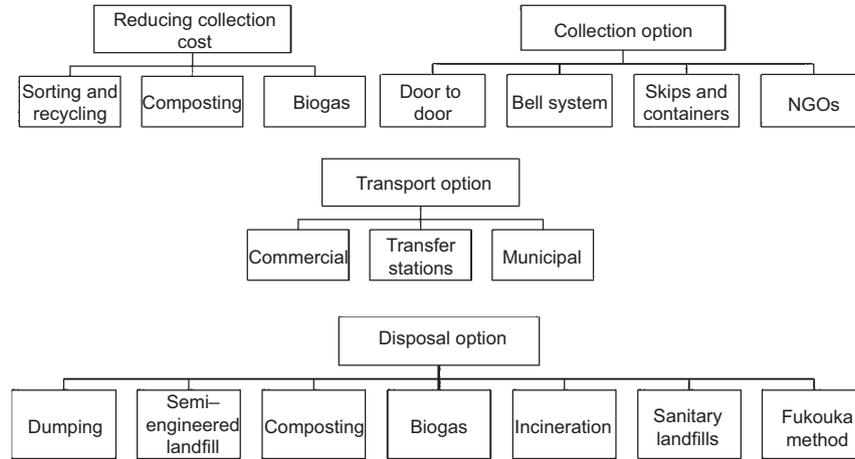


Figure 3. Sludge waste management strategy in Sri Lanka

and commercial and industrial establishments. Handcarts and waste trucks of different form and size are used to collect municipal waste. Legally established low-income households usually have access to a communal waste bin. However, squatter settlements do not have a waste disposal service and waste is just dumped in open spaces. One of the most important issues with regard to municipal waste management policy is to encourage minimum use, reuse and recycling. The waste recycling industry provides employment for tens of thousands of families in many cities. However, income from waste recycling for poor families is meagre and some working conditions are below acceptable standards.

### 3.2 Sewerage system

The sewerage system in Colombo is over 100 years old. The people in Colombo and its vicinity have experienced inconvenience and unsanitary conditions due to frequent sewage outflow from sewers that have become blocked by accumulated sand, sludge and domestic garbage. Wastewater, related to a lack of stormwater drainage facilities, further exacerbates environment pollution (see Figures 4–7).

### 3.3 Urban transport

In developing countries, traffic management systems and driver and road-user behaviour are worse than in most high-income nations. The rate of accidents for the number of



Figure 4. Blocked drainage system



Figure 5. Damaged drainage system



Figure 6. Improper drainage system

vehicles registered is greater and buses are overcrowded far beyond tolerable limits. Legislation to control such overloading is desirable, but that would increase fares, which in turn would affect low-income travellers. Without controls on overloading buses and alternative mass transit systems, it will be difficult to encourage car users to travel by public transport, which is a key component of sustainable urbanisation. Sustainable transport also encourages walking and cycling on relatively short journeys. In Sri Lanka, legislation is in place for the requirement of better maintenance of vehicles and control of emissions.



Figure 7. Poor drainage layout

## 4. Research methodology

The research and training division of the municipal engineering management section carried out a fact-finding survey relating to the nature of technical personnel associated with local authorities.

### 4.1 Objectives of the study

The purpose of the survey was to understand the future skills needs for municipal engineering management for sustainable development and decision making, and the need for capacity building and functional requirements of local urban authorities. The survey gathered information on existing infrastructure capabilities and data held for these purposes. A questionnaire was sent out to samples of various levels of local authority staff of selected local authorities to represent all categories. The objective was to provide up-to-date data to guide all senior staff members in terms of what management skills and expertise they may need stage by stage in professional municipal engineering management.

### 4.2 Scope of the questionnaire

Some key areas of information requested in the questionnaire are shown in Table 1. The questionnaire asked for the age and gender of respondents, but the survey was designed to avoid duplicating information on types of jobs, ages and qualifications obtained. For some urban authorities, an additional question asked whether the respondents would like to take part in follow-up discussions about the results of the survey.

### 4.3 Scale of response

There are 250 municipal councils, urban councils and *pradeshiya sabha* in Sri Lanka. A total of 307 responses were received, representing an overall response rate of 38%. Although this overall response rate is high, response rates were not consistent across the various groups; for example, the rate for urban authorities was 35%, rural authorities 47% and only 14% for northern authorities. More than 25 municipalities do not have e-mail access and these were reached by standard mail.

The most common areas of work of the respondents were utility services (water supply and distribution being the most prevalent subtype), transportation services (with rural roads as the most prevalent subtype) and recreation and cultural facilities.

### 4.4 Brief survey results

Most municipalities indicated a short-term focus on existing skill capacity and suggested that skills need to be strengthened in order to enable them to fulfil their role in municipal engineering management and to assume greater responsibilities in the profession of urban services along with relevant stakeholders, namely the community concerned, the public sector and civil society living in urban areas.

Job title  
Experience in current profession and qualifications  
Number of years in same job/same organisation  
Size of organisation  
Branch of engineering originally qualified in  
Knowledge in technological and managerial content of job  
Level of responsibility  
Number of people responsible to  
Jobs of people to whom instructions given  
Number and jobs of people directly responsible for  
Size of organisations and workplace  
Extent of autonomy in choosing work objectives  
Extent of authority in production goals, work schedules  
Extent that work is coordinated by on-the-spot discussion or feedback  
Extent of freedom to adopt own methods  
Extent that unexpected problems arise  
Extent that problems are solved according to known procedures  
Most difficult or demanding aspect of job  
Detail of managerial skills and expertise required in specific areas, received in training and anticipated additional required future skills or elements of management  
Expectation of job change  
Type of change expected  
Managerial ambitions  
Level of support expected from institution in achieving these ambitions  
General comments  
Other comments for future skills required

**Table 1.** Examples of information sought in the questionnaire for the study of future skill needs in municipal engineering in Sri Lanka

Many municipalities indicated that they are in a process of assessing required future skills to improve their service for the betterment and enhancement of welfare and lifestyles and to comply with expectations. Most respondents indicated a short-term focus on meeting current requirements as a determinant for longer term planning. Many have begun to or plan to build on the work done to improve management capabilities. Many municipalities intend to improve record-keeping.

## 5. Identified challenges

A higher level of basic education and literacy for those who intend working in municipal engineering management was identified. The main form of communication in municipal engineering in Sri Lanka is through the production of bills of quantities and drawings together with other related bidding documents. Instructions, decision making and other forms of information exchange are now in English and literacy has

become an issue. Technology and information systems management improvements were also noted as important aspects for the improvement of productivity.

Workmanship was highlighted as another problem. A vacuum in human resources supply has occurred as a result of emigration of competent labour, resulting in low productivity and poor quality work. The need to train and produce more municipal engineering professionals, middle-level technicians and tradesmen is an immediate requirement. Motivation for young people to join municipal engineering occupations is an urgent need that should be fulfilled.

The skills needed for sustainable public procurement (SPP) are similar to those usually identified in commercial procurement – influencing, negotiating, communication and analysis. Procurers may need to inform and develop their suppliers and contractors, and engage the market early in the process to maximise the opportunities for more sustainable and innovative solutions. They also need access to information that helps them make optimal decisions, including baseline procurement data. SPP requires the communication of a consistent message designed for the needs of various internal and external audiences. SPP should be supported by clear lines of accountability, with incentives and penalties based on delivery.

The establishment of proper quality management systems in both consultancy organisations and contracting companies needs to be pursued to enhance productivity. Higher productivity helps to achieve the objectives of ‘clean production’ and ‘green building’ concepts that are gradually being applied for sustainable development in Sri Lanka.

Poor financial management and disruptions in cash flow as a result of payment delays have affected municipal engineering. An escalation in prices of goods input in recent times has aggravated this problem and frequent interruptions of work have occurred. Very limited work has been done to study productivity in municipal engineering in Sri Lanka. There is thus a need for training in financial management and the physical measurement of construction productivity.

Urbanisation principally refers to the dynamics of the changing level of population living in urban areas. Other features of urbanisation are the concentration of a nation’s functional centres and infrastructure. Due to this urbanisation, there are many potential important areas of concern, including sustainable transport, economic development, reconciling municipal engineering and its environmental impacts, and changes and trends in governance.

The rise in population of urban areas is primarily due to natural increases within low-income communities and this

causes increased poverty. Migrants are generally not concentrated among the poor. According to UN Habitat (CBSL, 2011b), a slum household is a group of individuals living under the same roof in an urban area who lack one or more of durable housing, sufficient living area, access to clean water, access to sanitation or secure tenure. Types of slum housing range from concrete buildings and brick-built terraces to makeshift shacks made of salvaged materials such as timber, bamboo, tarpaulin, asbestos and scrap metal. This last category is the most notorious urban habitat, which often lacks access to clean water, sanitation, waste disposal and security, and poses a threat to slum dwellers themselves and the local environment and is hence a key feature of perceived urban blight. Some slum dwellers live on the streets. The terms slum, shanty housing, informal settlement, squatter shacks, fields and low-income housing are often used interchangeably.

## 6. Conclusions

The main purpose of this study was to develop a better understanding of the current municipal engineering management mission(s) and institutional and capacity needs in Sri Lanka. Such information could help identify the main gaps within the ministry that could be part of capacity building efforts to be handled by a proposed centre of excellence. The assessment was also intended to help the consulting team decide on and design an optimal place for the proposed centre within the municipal engineering management structure that would maximise benefits and avoid duplication of effort, and decide whether any modifications to the current organisational structure would be needed. The assessment was focused on human capacity and training needs within municipal engineering management in order to identify capacity building needs and then formulate a mission statement and scope of services for the proposed centre. These mainly include engineering and construction-related skills, public procurement skills, housing finance issues, human resources development, information technology and geographic information systems, and building-related quality control. All of these areas should be served by the proposed centre.

Sustainable development means meeting present requirements without compromising the ability of future generations to meet their own needs. It is not solely an environmental agenda. Fulfilling this duty requires an integrated approach to pursuing economic, social and environmental well-being, and all three components are central to success.

Sustainability is recognised by the government of Sri Lanka as a core component of good procurement, and departments need to improve their leadership and governance on the issue. Some departments were on course to be practising sustainable procurement across their business by the end of 2009, the

government's target year. Progress has been made and initiatives are in place that have both reduced environmental impact and saved money.

The Sri Lankan government's five-year action plan prepared for 2010–2015 has given a clear direction on how to make real progress towards better, more sustainable procurement which will in turn allow it to move forward on sustainable development and set an example to both businesses and consumers in other countries (DNP, 2009). To achieve value for money, procurement decisions need to be based on a thorough understanding of costs and benefits along with social and environmental impacts.

- Sustainable development entails realising a vision by implementing necessary constituent parts to meet the mosaic of inputs and outputs of an integrated programme. Sustainability cannot be generated in isolation without economic alliance with rural sectors. About one-third of the urban population (CBSL, 2011b) is regarded as low-income and a large proportion of this population live below poverty line. Overcrowded ramshackle housing and inadequate access to basic needs of water, sanitation, health care, education and other services are characteristics of slum settlements.
- To improve the living standards of the poor, high-density, low-income housing development should be promoted in partnership with private land owners, commercial enterprises, public sector and civil society organisations.
- Aided self-help to improve future skills in housing and environmental health infrastructure and services development by low-income communities is the current trend of slum upgrading.
- A key objective is empowering low-income communities to organise and improve their living environment through a process of education and training.
- Integrated slum upgrading embraces health, education, income generation, microcredit and the needs of children and women.
- Civil society organisations are an important force in initiating and mobilising integrated slum improvement programmes.
- Attraction of foreign investment and enterprise partnerships with external investors is vital to future skills of municipal engineering management.
- Walking, cycling and the use of public transport instead of private cars in cities during peak hours are common aspirations in both developed and developing nations.
- Pedestrian friendliness, tourist attractiveness, parks and open spaces are essential features in sustainable urbanisation.
- Good governance is important to attract inward investment. Good governance represents both government

responsibility and participatory civic engagement.

Industrialisation policies must favour less polluting industries and technologies. Environmental protection and integrated development need a national consensus of the stakeholders. Community participation in urban waste management, integrated drainage, wastewater management and urban farming are assets of sustainable urban development. Cities in developing countries have the formidable task of cleaning their rivers to use them as water sources to meet demand.

- Infrastructure sustainability depends crucially on the careful selection, innovative adoption and adroit implementation of technology appropriate to the set of circumstances. Attempts to boost housing and infrastructure without increasing the supply of skilled labour, land and material resources have caused cost escalations and inflation problems.

## 7. Recommendations

- Continuity of training and follow-up training provided to technical personnel should be continued beyond the initial training period. Post-training evaluation and timely updating is the most essential follow-up activity. Feedback on courses may encourage the need for training for others associated with activities carried out by technical personnel, with knowledge and awareness given during training sessions being applied in practical terms on site with the assistance of all other people involved in the whole process: contractors, draughtsmen, surveyors, lawyers, individual house builders, property developers and other professionals (engineers, architects and planners). All these categories of people and professionals should thus also be trained if productive results are expected from technical personnel after training. The training needs of these categories should be assessed and training packages continually assessed.
- Organisational integration should ensure that sustainable procurement is reflected in organisational goals, policies and management performance indicators. Awareness of sustainable procurement should be promoted throughout the organisation. Staff must have the appropriate skills, knowledge and access to information sources to apply the principles and practices of sustainable procurement. Organisations should: support the provision of, and access to, training programmes that improve the level of staff awareness about sustainable procurement; consider the establishment of a core of experts to assist and advise other organisations on sustainable procurement processes and practices; review operational arrangements that create a barrier to the adoption of sustainable procurement and consider the implementation of environmental management systems that drive sustainable procurement and reduce consumption.
- It is important to develop policies that: consider sustainability factors in all stages of procurement; provide practical guidance and tools to assist practitioners in the delivery of procurement outcomes that satisfy sustainability objectives; ensure any related procurement programme and processes involving measures to develop Sri Lankan strategic sourcing and market engagement consider incorporating sustainability objectives in their development and application where applicable; ensure that government procurement complies with obligations under international agreements.
- Policy-related changes will create a situation to strengthen the mechanism of training technical personnel in the local government sector in the future. Municipal engineering management for sustainable development is about improving the capacity of urban areas to enable inhabitants to maintain a decent quality of life and ensure that cities – as the centres of multi-functional operations in the nation – continue to function efficiently.
- Skills training and sustainable development and maintenance of housing and infrastructure services are fundamental to sustainable urbanisation.
- The solutions should embrace all key stakeholders – from foreign investors to low-income unemployed inhabitants. Economic, technological and environmental resources and constraints should be appreciated.
- Appropriate training and education in municipal engineering management is needed for the growing demand for multi-functional urban resources. Relocation of staff in municipal engineering and recreation management will be required to better deal with the identified challenges. There is a need for formal and informal environmental education and professional training.
- New professional skills will be required that are necessarily different from those for traditional municipal engineering management. In most cases, a new kind of urban green manager is needed: one who, in addition to being able to deal with the multiple technical dimensions of municipal engineering management, can also handle the different stakeholders' interests and can mediate trade-offs. This new form of municipal engineering management will have to combine different sets of knowledge with an understanding of city government, society and its needs. The urban green municipal engineer will also need skills in ecological landscape planning, communications, sociology, municipal, commercial and utility arboriculture, landscape management and contracting, supervision of parks and recreation lands, duration of arboreta and botanical gardens, habitat restoration (especially disturbed areas and/or wetlands), horticulture education and research in plant-stress physiology.

---

**REFERENCES**

CBSL (Central Bank of Sri Lanka) (2008) *Central Bank of Sri Lanka Monthly Report January 2008*. CBSL, Colombo, Sri Lanka.  
CBSL (2011a) *Central Bank of Sri Lanka Annual Report 2011*. CBSL, Colombo, Sri Lanka.

CBSL (2011b) *Central Bank of Sri Lanka Monthly Report January 2011*. CBSL, Colombo, Sri Lanka.  
DNP (Department of National Planning, Ministry of Finance and Planning) (2009) *Five Year Action Plan for 2010–2015*. DNP, Colombo, Sri Lanka.

---

**WHAT DO YOU THINK?**

To discuss this paper, please email up to 500 words to the editor at [journals@ice.org.uk](mailto:journals@ice.org.uk). Your contribution will be forwarded to the author(s) for a reply and, if considered appropriate by the editorial panel, will be published as discussion in a future issue of the journal.

*Proceedings* journals rely entirely on contributions sent in by civil engineering professionals, academics and students. Papers should be 2000–5000 words long (briefing papers should be 1000–2000 words long), with adequate illustrations and references. You can submit your paper online via [www.icevirtuallibrary.com/content/journals](http://www.icevirtuallibrary.com/content/journals), where you will also find detailed author guidelines.