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ZHANG TONG

SUSTAINABLE URBANISM AND ARCHITECTURE IN SCANDINAVIA

GREEN NORTH



绿色北欧 可持续发展的城市与建筑

张彤 主编

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内 容 提 要

作为世界上社会、经济、文化发展最为均衡、国民平均生活水平和社会福利最高的北欧,在环境保护与经济社会的可持续发展方面一直处于世界的前沿。本书以北欧地区的优秀案例为研究对象,分别从城市规划、街区设计、建筑设计以及景观等各个层面系统介绍北欧可持续性城市建设知识体系、先进技术、实施操作以及后期的环境质量评估。书中也介绍了北欧地区历史建筑的保护与改造。

本书可供城市规划、建筑设计、城市研究人员学习,也可以供相关专业师生阅读。

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前言

张彤

我们并不是从祖先那里继承了地球,而是向子孙借取。

从上世纪60年代开始,自然资源和矿物燃料的过度消耗使人类面临前所未有的能源危机,消耗型的发展模式与呈指数增长的社会生产导致了区域和全球范围内日益沉重的环境压力。1987年世界环境与发展委员会在《我们共同的未来》报告中第一次阐述了现在被广泛引用的可持续发展的概念:“既满足当代人的需求,又不损害后代满足自身需求能力的发展模式。”

城市与村镇的 built environment 是一系列社会与经济过程的结果,对于可持续发展具有核心作用,并标志其发展水平。中国正在经历迅猛的城市化过程,2005年我国建筑行业消耗的钢材与水泥分别占全世界总量的26%和47%,新增建筑面积占全世界总量的近50%,而建筑行业的总能耗则达到了社会能源消耗总量的45%。在某种程度上,中国当前的城镇建设,其积极与消极的方面,都将对全球的可持续发展进程产生不可忽视的重要影响。

在过去的几十年里,斯堪的那维亚半岛成为世界上社会经济文化发展最为均衡、人民平均生活水平和社会福利最高的地区。长期以来,该地区在环境保护与可持续发展方面一直处于世界的前沿,国家和地方的各项政策在很大程度上突出可持续发展的理念、目标和执行策略。在城市建筑领域,除了强调优质健康的生活环境外,还要求对建设优质与可持续的地区生态环境和全球生态环境有所助益。为此,政府设立专门部门,制定严格的规范与制度,大力推进可持续发展政策的执行。同时建筑行业内部对于生态节能和环境保护具有广泛的自觉意识,在相关技术的研究与应用上积累了丰富的经验。从20世纪年代以来,以芬兰维基佳区、马尔默西港区改造以及斯德哥尔摩哈默比湖城为代表的大规模高质量生态城区的建设充分证明了北欧诸国在可持续性城市建设方面毋庸置疑的领先地位。

从2006年10月开始,东南大学建筑学院与瑞典皇家工学院产业生态系合作,对斯堪的那维亚半岛的可持续性城市与建筑做了较为系统的研究,收集分析了具有代表性的城市设计与建筑设计案例,部分成果汇集成为本书,希望对中国

Foreword

ZHANG Tong

We have not inherited the earth from ancestor, but have borrowed it from descendants.

Since the 1960s, mankind has been facing the unprecedented energy crisis due to the excessive consumption of natural resources and fossil fuel. Development based on resource consumption and exponential growth of social production has increased environmental pressure heavily on various regions and even on the whole world. In 1987, World Commission on Environment and Development for the first time explained the concept of sustainable development. Nowadays his quoted extensively in its report of *Our Common Future* which satisfies the current needs of society without compromising the needs of future generations.

Architectural environment of urban and rural areas, resulted from a series of social and economic processes, plays a core role in the sustainable development and represents development level. China is undergoing an accelerative urbanization process. In 2005, steel and concrete used in our building industry respectively accounted for 26% and 47% of the total amount of consumption in the world; and the newly-increased floor area accounted for nearly 50% of the total amount in the whole world; however, total energy consumption of building industry reached 45% of the total social energy consumption. To a certain extent, China's present urban construction, from its positive or negative respect, will have an important influence that can't be ignored on the global sustainable development process.

Over the past decades, Scandinavia has become a region in which social economic and cultural development are the most balanced in the world and people in average have the highest living standard and social welfare. For a long time, this region has been standing in the front of the world on environmental protection and sustainable development. National and local policies emphasize on sustainable development to a great extent. Nordic countries with Sweden as their representative emphasize the high-quality healthy living environment very much in the field of urban architecture, which benefits to regional and even ecological environment to some extent. For this purpose, governments set up special agencies and work out strict standards and rules with aim to vigorously promoting the implementation on policies on sustainable development. At the same time, the industry has been aware of the importance of ecological energy-conservation and environmental protection and has accumulated abundant experiences in the research and application of relevant technologies. Since 1990s, the construction of large-scale and high-quality ecological urban areas with Viikki Community in Helsinki, Finland, Västra Hamnen in Malmö, Sweden, and Hammarby Sjöstad in Stockholm, Sweden as representatives, have fully proved that Nordic countries have stood on an unquestionable leading position in sustainable urban development.

From October, 2006, School of Architecture, Southeast University, China has been cooperating with Department of Industrial Ecology, Royal Institute of Technology, Sweden, on systematic-research of Scandinavian sustainable urbanism and architecture. Some representative cases of urban planning and architectural design have been selected and studied.

当前的城镇建设有所启迪与助益。

本书共分6章。第1章汇集了研究小组成员撰写的主题论文,其中包括东南大学建筑学院张彤教授以瑞典为个案研究对象,对该国可持续性城市建设的目标、政策、技术策略、行业规范以及代表性案例所做的系统研究;瑞典著名的生态建筑专家瓦利斯·鲍卡戴斯与玛丽亚·布洛克合作撰写的论文阐述了可持续性城市与建筑的核心概念与关键性技术策略;瑞典皇家工学院产业生态系主任罗纳德·维纳斯坦教授的主题论文则介绍了享有国际盛誉的斯德哥尔摩哈默比湖城项目;此外东南大学建筑学院的顾震弘博士和王湘君博士分别撰文介绍了瑞典可持续性住区建设的模式和北欧城市规划和建筑设计中的可持续性评估方法。

从第2章到第6章,分别以斯德哥尔摩哈默比湖城、马尔默西港区改造、赫尔辛基维基实验新区、既有建筑的再利用与生态化改造以及其它案例为主题展开案例研究。各章节的资料采集、整理、研究和编写工作都是由小组成员合作完成的,参加工作的人员包括:东南大学建筑学院的张彤教授、吴晓副教授、汪晓茜副教授、陈宇博士、顾震弘博士、王湘君博士,瑞典皇家工学院产业生态系的罗纳德·维纳斯坦教授、何颖女士、埃莉卡·佩普克女士。东南大学建筑学院的苏玲、朱君、赵玥、孙静、谢泉等同学,南京工业大学建筑与城规学院的杨融同学参与了相关资料的整理以及本书的版式设计工作。

本项研究得到教育部国家留学基金委的资助,并得到中国驻瑞典大使馆教育处的大力支持。

The results are compiled into this book. Hopefully it could help and inspire, to some extent, the present urban development in China.

The book is composed of 6 chapters. Chapter one collects the theme theses written by the members of the research group. Using Sweden as a study case, the thesis of Professor ZHANG Tong, School of Architecture, Southeast University, focuses on the targets, policies, implementation strategies, criterions and representative projects of sustainable urban development in this country. Varis Bokalders and Maria Block, famous Swedish experts of sustainable architecture, present their study on the key concepts and technique strategies of sustainable urbanism and architecture. The thesis of Professor Ronald Wennersten, head of Department of Industrial Ecology, Royal Institute of Technology, Sweden, gives a comprehensive introduction of the project of Hammarby Sjöstad, which enjoys high reputation on sustainable urban development. Furthermore, the theses by Dr. GU Zhenhong and Dr. WANG Xiangjun give introductions on paradigms of Swedish sustainable communities and the assessment for sustainable built environment in North Europe respectively.

Titled as Hammarby Sjöstad, Västra Hamnen in Malmö, Viiki Community, Helsinki, Reuse and ecological Renovation of Existing Buildings and Other Cases, the contents from Chapter two to Chapter six are mainly about the case studies of representative projects of sustainable urbanism and architecture in Nordic countries. The work of material collection, data processing, research and compiling were undertaken by the collaboration of group members. Persons involved in the work include: Professor ZHANG Tong, Associate Professor WU Xiao, Associate Professor WANG Xiaoqian, Dr. CHEN Yu, Dr. GU Zhenhong, Dr. WANG Xiangjun, School of Architecture, Southeast University, China; Professor Ronald Wennersten, Ms. HE Yingfang, Ms. Erica Pelpke, Royal Institute of Technology, Sweden. Some students made contributions to the work of data processing and layout design. They are SUN Ling, ZHU Jun, ZHAO Yue, SUN Jing and XIE Quan from Southeast University and YANG Rong from Nanjing University of Technology.

The research work and the compiling of this book were sponsored by China Scholarship Council, Ministry of Education and vigorously supported by Directorate of Education, Embassy of China in Sweden.

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1

可持续发展的北欧城市与建筑

Chapter 1 Sustainable urbanism and architecture in Scandinavia

1.1 绿色福利——可持续发展的瑞典城市与建筑

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作为世界上社会、经济、文化发展最为均衡、国民平均生活水平和社会福利最高的国家之一,瑞典在环境保护与可持续发展方面一直处于世界的前沿。本章从国家的整体战略、城市发展与建筑行业中的环境目标、政策法规、政府相关部门设置以及行业内部的自律规范等各个层面详细介绍瑞典在可持续性城市规划与建筑设计方面的经验。马尔默的西港区改造和斯德哥尔摩哈默比湖城这两个具有高标准环境质量目标的大尺度城市开发项目,成为瑞典 21 世纪可持续发展城市建设的优秀实例。

1.1.1 可持续发展作为国家的整体战略

位于欧洲北部斯堪的那维亚半岛的瑞典,国土面积 45 万 km²,人口约 890 万。在过去的几十年里,它成为世界上社会、经济、文化发展最为均衡、国民平均生活水平和享受社会福利最高的国家之一^①。长期以来,瑞典在环境保护与可持续发展方面一直处于世界的前沿,国家和地方的各项政策在显著的位置上突出与强调可持续发展(图 1.1)。

瑞典对于环境问题的关注开始于 20 世纪上半叶的自然保护运动。到 20 世纪 60 年代,对于工业污染的处理问题已经被摆在重要的位置上。1972 年,联合国第一次环境与发展大会在斯德哥尔摩召开,从那以后瑞典政府不断举办各种有关环境问题的活动,在推进跨国环境问题的国际条约方面表现得尤为积极。

2002 年,在约翰内斯堡全球峰会和欧盟可持续发展策略的基础上,瑞典政府颁布了国家可持续发展策略的修订版“瑞典可持续发展经济、社会和环境发展策略”,其内容包括经济、社会与环境的各个方面。该策略强调瑞典的可持续发展基于三项基本原则:

- 瑞典的可持续发展只有在全球和区域合作的基础上才能实现;
- 可持续发展的政策、法规和关注必须成为主流,融入现行的所有政策领域中;
- 需要在国家层面上采取进一步的措施,以确保构成可持续发展基础的重要资源在长时期内得到保护。

2003 年 5 月,瑞典成为第一个通过与环境相关的议案以直接应对约翰内斯堡行动计划的国家。国会这项被称为“我们共同的责任——瑞典的全球发展政策”的议案“提出了政府在这方面操作的新目标是致力于公平与可持续的全球发展”。

瑞典可持续发展的国家策略在环境方面充分体现于 1999 年国会通过的 15 项国家环境质量目标,在 2005 年,这个目标增加至 16 项。这 16 项环境质量目标为有关环境问题的计划和行动建立了一个明确清晰的框架,指导社会各个层面的行动。

1.1 Green welfare—sustainable urbanism and architecture in Sweden

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As one of the most balanced developed countries with high standard of living and mixed systems of capitalism and extensive welfare benefits, Sweden has been at the forefront of environmental protection and sustainable development for a long term. From various aspects of general state strategies, national environmental quality objectives, policies and regulations, the responsible government authority and the self-discipline initiatives within building sector, this paper focuses on introducing the experiences of sustainable urbanism and architecture in Sweden. As the recently developed urban projects with environmental control programme of high standard, Västra Hamnen in Malmö and Hammarby Sjöstad in Stockholm demonstrate the achievements of urban sustainability of Sweden in the 21st century.

1.1.1 Sustainability as a general strategy of the state

Sweden is located in Northern Europe, with a surface area of approximately 450,000 sq km and a population of about 8.9 million. For decades it has become one of the most balanced developed countries with high living standard and a mixed system of capitalism and extensive welfare benefits^①. For a long term, Sweden has been at the forefront of environmental protection and sustainable development around the world, whose policies place a great deal of emphasis on sustainable development, no matter at national or regional and municipal levels (Fig. 1.1).

Environmental concerns began in Sweden with nature protection in the first half of the twentieth century, and dealing with local effects of industrial emissions had already become important in the 1960s. Stockholm hosted the first UN Environmental and Development Conference in 1972. Since then, through many national and international undertakings Sweden has continued to demonstrate its sustainable development commitment, and has been active in promoting international agreements for addressing cross-border environmental problems.

The “Swedish Strategy for Sustainable Economic, Social and Environmental Development (Communication 2003/04:129)” which is a revised version for the national strategy for sustainable development was presented in 2002. The single, multi-dimensional strategy builds upon the 2002 Johannesburg World Summit on Sustainable Development, the EU strategy for sustainable development, and addresses the three dimensions of sustainable development: economic, social and environment (Swedish Government 2004: 5). Sweden’s version of sustainable development rests on three key premises around which the strategy has been created:

- Sustainable development in Sweden can only be achieved within the context of global and regional co-operation.
- Sustainable development policies, measures and concerns must be mainstreamed, i.e. integrated into all existing policy areas.
- Further action at national level will be needed to ensure long-term protection of the critical resources that constitute the basis for sustainable development (Swedish Government 2004: 4)



图 1.1 斯德哥尔摩郊区的自然环境

Fig. 1.1 The natural environment around Stockholm

这 16 项环境质量目标是:

- 减少气候影响;
- 清洁的空气;
- 消除非自然酸化;
- 无毒害环境;
- 保护臭氧层;
- 安全的辐射环境;
- 零富营养;
- 充满生命力的湖泊与河流;
- 高质量的地下水;
- 平衡的海洋环境,充满生命力的海岸区域与群岛;
- 茂盛的湿地;
- 可持续发展的森林;
- 多样的农业景观;
- 壮丽的山川景观;
- 优质的建筑环境;
- 丰富多样的动植物。

在执行层面上,政府的基本目标是在 2020 年以前实现上述环境质量目标中的 15 项(第一项“减少气候影响”的目标实现期限是 2050 年),把一个主要环境问题都已解决的社会交给下一代(图 1.2)。

2001 年到 2005 年之间,通过一系列的讨论,瑞典国会又设定了 72 个中间目标。这些中间目标描述了 2010 年的环境状态,充实了环境质量的目标体系,控制其实施操作过程。



On May 23, 2003 the Swedish Government was the first government internationally to pass an environment related bill in the direct response to the Johannesburg Plan of Implementation. Tabled in Parliament, the bill Our Common Responsibility—Sweden's Policy for Global Development proposes new goals for all aspects of Government operations with the aim of contributing to fair and sustainable global development.

In 1999, the Swedish Parliament adopted 15 national environmental quality objectives, to be attended by the year 2020 (2050 in the case of the objective "Reduced Climate Impact"). In 2005, a 16th objective was added. The environmental quality objectives create a transparent and stable framework for environmental programmes and initiatives, and serve to guide such efforts at various levels in society. The aim for these objectives is to pass on to the next generation a society in which all the major environmental problems have been solved (Fig. 1.2).

Between 2001 and 2005, in a series of decisions, the Swedish Parliament laid down 72 interim targets. These targets flesh out the environmental quality objectives by describing the situation in a given year, usually 2010.

An overview of the 16 environmental quality objectives is presented below.

- Reduced climate impact
- Clean air
- Natural acidification only
- A non-toxic environment
- A protective ozone layer
- A safe radiation environment
- Zero eutrophication
- Flourishing lakes and streams
- Good-quality groundwater
- A balanced marine environment, flourishing coastal areas and archipelagos
- Thriving wetlands
- Sustainable forests
- A varied agricultural landscape
- A magnificent mountain landscape
- A good built environment
- A rich diversity of plant and animal life

图 1.2 把一个主要环境问题都已解决的瑞典交给下一代

Fig. 1.2 - Pass on to the next generation in which all the major environmental problems have been solved

1.1.2 城市与建筑领域内的可持续发展策略

1) 历史经验

身处极地或邻近极地的极端自然环境,北欧人对于自然条件和资源具有一种与生俱来的敏感和关切。利用自然地形和环境条件,以较小的代价换取与自然和谐一直是斯堪的纳维亚建筑最具智慧的传统之一。在现代社会,瑞典对于建筑领域内环境问题的关注最早出现在 20 世纪 60 年代,一些激进的环保主义者在小范围内试验所谓“生态村”的建设。在这些小规模生态村中,居民们自己建设房屋,主动地规划和形成他们的生活环境,强调房屋的建设应尽量减轻环境负担,取得与自然的和谐共生。这是在建筑领域中最早出现的针对传统居住方式及其产生的环境问题的反思与批判(图 1.3)。

虽然生态村为探索建筑的环境问题提供了知识与经验,但是它们并不足以降低建筑对环境的负面影响,400 万个瑞典家庭中只有几百户住在生态村中。到了 20 世纪 90 年代,一些地方住宅公司开始对环境问题产生兴趣,着手对已有建筑进行改造以减少对环境的影响,这就是所谓的对现有建筑的“生态更新”。

与此同时,政府也意识到环境问题的重要性,斥资 54 亿瑞典克朗用于地方项目建设,10 亿瑞典克朗用于基础设施建设以减轻环境负担。这在瑞典被称为“生态巨资”。

2) 国家环境质量目标之“优质的建筑环境”
在国会通过的国家环境质量目标中,对“优质的建筑环境”这一目标的整体描述是这样的:

“城市、市镇与其他建筑环境必须提供一个优质、健康的生活环境,并且对建设优质的地区环境和全球环境有所助益。自然与文化遗产必须得到保护和发展的。建筑物与构筑物的选址和设计必须遵循正确有效的环境原则,并且采取有利于推进对土地、水和其他资源的可持续管理的方法。”

1.1.2 Sustainability within the sector of urban development and building construction

1) Historical experience

Living in the extreme climate of northern area, Nordic people have a sort of native concern to the natural environment and resources. Living in the harmony of nature with minimum cost has always been one of the most valuable traditions of Scandinavian architecture. Since the 1960s there have been several small scale attempts in Sweden to live more in accordance with the nature in so called “eco-villages” which mostly are small residential areas with houses constructed to reduce the environmental load. The “eco-villages” constitute a criticism on conventional living and the dominating life style that creates the environmental problems (Fig.1.3).

Although the eco-villages have provided sources of knowledge and inspiration for environmental work in housing, but they are not sufficient to reduce negative impact on the environment since just a few hundred of Sweden's four millions households live there. During the 1990s an interest has emerged in some municipal housing companies to work with environmental issues and to renew existing buildings so that environmental impact is decreased, which is so-called “eco-renewal”.

Also the government has become interested in environmental issues and has set aside SEK 5.4 billion for municipal projects and SEK one billion for infrastructure projects with the purpose to decrease the load on the environment, the so called “eco-cycle billions” (Miljödepartementet, 1997).

2) National environmental quality objective: “A Good Built Environment”

In the national environmental quality objectives adopted by the Swedish Parliament, the objective of A Good Built Environment is described as follows:

“Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.”

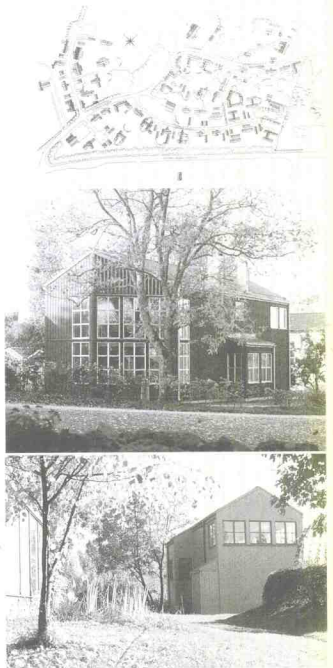


图 1.3 位于斯德哥尔摩东北 45 km 处的 Håbe Tibble 生态村,始建于 1978 年

Fig. 1.3 Håbe Tibble kyrkby (Church Village), 45 kilometre north-east of Stockholm, constructed from 1978

这个目标预计通过一代人的努力得到实现(图 1.4)。在这个整体目标框架下包括以下分项目标:

- 建筑环境创造美的体验与和谐的氛围, 提供多样的居住、工作、服务与文化设施, 使每一个人拥有完整、充实和令人兴奋的生活, 同时减少对日常交通的需求。

- 房屋和建成环境中的文化、历史和建筑遗产, 包括场所与风景的特殊遗产, 应该得到保护与发展。

- 发展一种可持续性的城市结构, 既包括新建建筑、工业与基础设施的选址, 也包括对现有建筑的使用、管理和改造。

- 生活与休闲环境, 以及工作环境的设计在可能情况下须满足社会的要求, 远离噪音, 并且易于接近阳光、清洁的水和空气。

- 位于建成区域周边、易于到达的未开发自然环境和绿色空间应得到保护, 以使其满足游戏、休闲、当地农业和健康的局域气候的需求。

- 生物多样性应该得到保护和发展。

- 交通与交通设施的选址和设计应尽量减少对城市 and 自然环境的干扰, 尽量减少健康与安全方面的风险以及其他对环境的危害。

- 利用优质有效的公共交通系统, 提供充足安全的步行与自行车交通设施。

- 人们不会受到有害空气污染、噪音、有害放射物质的侵害, 也没有其他有关健康与安全的不可预见的风险。

- 土地和水源远离有毒的危险物质以及其他污染物。

- 对于能源、水和其他自然资源的利用应是高效节能和对环境有益的, 优先选择可再生资源。

- 只有特殊设备在没有其他可替代能源的情况下才使用天然气。

- 保护砂砾层有益于饮用水的提供, 保护自然与文化景观。

This objective is intended to be achieved within one generation (Fig.1.4).

The outcome within a generation for this environmental quality objective should include the following:

- The built environment provides aesthetic experience and wellbeing and offers a wide range of housing, workplaces, services and culture that give everybody the opportunity to live a full and stimulating life, while reducing everyday transport needs.

- The cultural, historical and architectural heritage in the form of buildings and built environment, including places and landscapes with special assets, are protected and enhanced.

- A sustainable urban structure is developed, both in connection with the location of new buildings, industries, infrastructures and with the use, management and conversion of existing buildings.

- The design of living and leisure environment, and wherever possible the work environment, must meet society's requirements be free from noise and have access to sunlight, clean water and clean air.

- Areas of unspoiled nature and green spaces close to built-up areas, which are easily accessible, should be protected in order to meet the need of play, recreation, local farming and a healthy local climate.

- Biological diversity should be preserved and enhanced.

- Transports and transport facilities are located and designed in such a way as to limit interference with the urban or natural environment and so as not to pose health or security risks or be otherwise detrimental to the environment.

- Environmentally sound, good-quality public transport systems are available, and there are plenty of facilities for safe pedestrian and cycle traffic.

- People are not exposed to harmful air pollutants, noise nuisance, harmful radon levels or other unacceptable risks to health or safety.

- Land and water areas are free of toxic and dangerous substances and other pollutants.

- The use of energy, water and other natural resources is efficient, resource-saving and environmentally sound; the renewable energy sources are preferred.

- Natural gas is only used where it is not possible to use substitutes in specific applications.

- Deposits of gravel that are valuable for the drinking water supply and the natural and cultural landscape are preserved.

- The quantity and dangerousness of waste are decreasing.

- Waste and residue should be separated by categories and recycled on a cooperative basis by urban areas and surrounding rural areas.

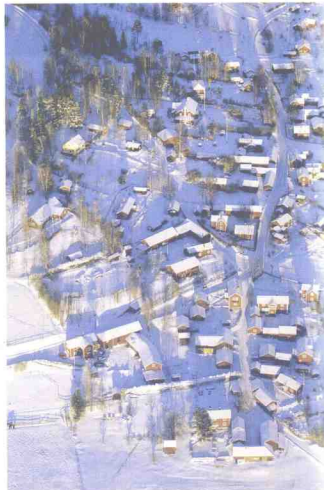


图 1.4 典型的瑞典乡村景观
Fig. 1.4 Living-scape of Sweden's countryside

● 减少垃圾的数量和危害。

● 应对垃圾和残余物进行分类,并在城市和郊区分块集中循环利用。

为了确保整体目标的实现,在执行计划中还制订了一系列时间节点,并针对各个时间节点制订了详细的分阶段实施目标²。

3) 相关政府机构设置

在瑞典政府中负责“优质的建筑环境”这一环境质量目标是瑞典住房、建筑与规划署(Boverket)。Boverket 是瑞典执行可持续发展政策“绿色福利国家”³的一个关键机构,尤其是在房屋建设与城市发展方面。它不仅负责全国范围内的规划、土地与水资源管理,城市发展、住宅与房屋建设,还负责制定与修改有关规划设计、房屋建设的法规,并代表瑞典参与有关城镇建设方面的欧洲事务、执行欧盟的政策指令。Boverket 有三个组成部门,分别是规划与城市发展处、建筑处以及瑞典可持续发展委员会,后者于 2005 年并入 Boverket⁴。

政府通过可持续发展部⁵向 Boverket 发出指令。鉴于城市建设与空间规划的复杂性,Boverket 也从其他政府部门接受指令并与它们合作。此外,它还与各地方政府和当地社团紧密合作。

4) 建筑规范与行业自律

在 Boverket 编制的最新的《建筑规范》(Building Regulation, BBR 10823—3261/2001)中,专门设立“节能与热维持”专篇,对房屋建筑中的能耗问题做出强制性的规定和建议。该篇的总论规定:“房屋的设计必须通过降低热损耗环节,经济高效地使用热能和电能来限制对能源的需求。”该篇各章节对如何在建筑围护体设计、通风设计以及热能的产生与分配等方面减少建筑的热损耗做出了详尽的定性和定量规定,对热能和电能使用的效率和经济性也做出了定性的规定和强制性的定量要求⁶。

除了政府部门制定一系列政策目标与建筑规范,并大力推进其实施以外,可持续发展的理念在瑞典建筑行业内部也取得了广泛的共识。在瑞典建筑与房地产行业,有一个由 30 个机构联合组成的委员会,名为“生态循环委员会”。其目标是:“通过自觉的努力,在市场层面并与政府主管部门和政策法规紧密合作,通过可靠的、有效的合作与系统化的工作环境,使得环境得到持续的改善。”⁷

生态循环委员会在主动完成 2000 环境评价的基础上,于 2003 年 10 月制订了一项环境计划——“2003—2010 环境计划”。该计划确定了一系列环境目标:

(1) 节约能耗

环境目标 1: 建筑物

● 从 2000 年到 2010 年,每平方米建筑面积使用的购买能源应减少 10%。

● 从 2000 年到 2010 年,以采暖为目的矿物燃料消耗应减少 20%。

环境目标 2: 市政工程

In order to insure the implementation of general objective, there are a series of interim targets set down according to the detailed time schedule⁸。

3) The responsible government authority: Boverket

The authority in Swedish Government, which takes responsibility of the objective of A Good Built Environment, is The National Board of Housing, Building and Planning—Boverket. Boverket is one of the Government's key tools for implementing its sustainable development policy “The Green Welfare State”⁹, especially in terms of housing, construction and urban development. It is the national agency for planning, the management of land and water resources, urban development, building and housing. Boverket monitors the function of the legislative system under the Planning and Building Act and related legislation and proposes regulatory changes. In these fields Boverket represents Sweden in the European Commission, and works for the implementation of EU directives in the Swedish legislation.

Boverket has three main parts:

- The Division of Planning and Urban Development,
- The Division of Building Construction,
- The Swedish Council for Sustainable Development, which merged with Boverket in 2005¹⁰.

The Government gives its main instructions and commissions to Boverket through the Ministry of Sustainable Development¹¹. But due to the integrative nature of urban development and spatial planning Boverket also gets commissions from other ministries as well as cooperates with many other national agencies. Additionally, Boverket works in cooperation with many other Swedish Association of Local and Regional Authorities, as well as the County Administrative Boards and municipalities.

4) Building regulation of energy efficiency and self-discipline of sustainability in the building sector

The new edition of *Building Regulation* (BBR 10823—3261/2001), which was compiled by Boverket, has set up a chapter specifically for energy economy and heat retention. It contains mandatory provisions and recommendations on that buildings shall be designed so that the energy requirement is limited by low heat losses, efficient use of heat and efficient use of electricity. The detailed provisions and recommendations are given both qualitatively and measurably¹².

Besides the environmental quality objectives and a series of strategies set down and effective implementations by the Swedish Government, there exists a common environmental consciousness of sustainability in the building sector of this country. An association called *The Ecocycle Council* is composed of around 30 organizations within the Swedish building and real estate sector. The aim of the organization is “that the building sector, through voluntary efforts, on market grounds and in close co-operation with authorities and legislation, succeeds in conducting credible, effective, co-ordinated and systematic environmental work that results in permanent environmental improvements”¹³.

¹⁴ Based on an environmental review of 2000 which has identified the significant environmental aspects of the building sector, the Ecocycle Council has conducted a unique project-