Information Landscapes:

Sustainable Community Design on the World Wide Web

BY

CHRIS SALE

A Practicum
Submitted to the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of

MASTER OF LANDSCAPE ARCHITECTURE

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES
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Chris Sale   1997 (c)

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Chapter 1

1.01 Problem Statement:

The purpose of this practicum is to demonstrate the potential of internet technology as a tool to help bridge the knowledge gap between researchers and designers, and designers and clients through the illustration of Sustainable Community Design (SCD).

> "Sustainable Community Design refers essentially to a practice of planning, designing, building and managing, and the social-economic development of communities following the precepts of sustainable development set out by the UN Brundtland Commission in 1987. In 1986, Van Der Ryn and Calthorpe published their "design synthesis for cities, suburbs and towns" -- a foundational study of conceptual and empirical approaches, environmental, landscape, urban design and architectural themes, and illustrative project designs for creating "sustainable communities.""[1]

Sustainable communities have been shown by numerous studies over the past decade to deliver the same or better living conditions as are currently available in traditional communities, but with a reduced reliance on fossil fuels, and improved overall environmental and social benefits[2].

Sustainable community design is a complex term. It involves issues of environmental and social sustainability; the concept of community, both its physical and social aspects; and the practice of design in its

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[1]Perks, William T. *http://www.cadlab.umanitoba.ca/la_www/sustainable/ intro01.htm*   Jan 15th, 1998.

[2]Perks, W. T. and D. Van Vliet. 1993 *Assessment of Built Projects for Sustainable Communities.*   Canada Mortgage and Housing, External Research Program, Ottawa. Draft p. i

many applications.   Each individual component of this synthetic
concept raises many issues.   For researchers, designers, policy
makers, and clients engaged in the discussion, or planning of a
community, the examination of these issues will stimulate responses
which bring with them specific physical forms.   However, with so
many issues involved, it is difficult to clearly envision how a
sustainable community would appear in physical and ideological
implementation.   This lack of clarity hinders public understanding of
sustainable community design and impedes its acceptance.   This
illustrates the need for a strategy to help communicate the idea of
SCD not only in textual form, but in visual form as well.   In 1996,
Canada Mortgage and Housing Corporation (CMHC) recognized this
problem, and validated the proposed approach to it by funding the
research of Epp and Perron in undertaking the SCD web site as one
approach to visualizing the issues involved in Sustainable Community
Design.

It is this task, the illustration or visualization of the concept of
sustainable community design, on which the focus of the case study,
for this practicum, is based.   Just as SCD is a complex issue, its
illustration will have to take on a complex form in order to create a
clear and understandable explanation.   Such a multi-faceted
information set can best be approached not just with one tool of
explanation but instead with several.   The most appropriate of the
tools can then be used in combination to explain each facet of SCD.
The Sustainable Community Design web site is a multimedia
hypertext document that attempts this task and forms the basis for

this practicum.   It is located on the World Wide Web at the following address:

http://www.cadlab.umanitoba.ca/la_www/sustainable/index.htm

Visualization "is a form of communication which is universal, and which has the ability to form an abstraction of the real world into a graphical representation which is comprehensible to a wide range of people."[3]   For the purposes of this study, visualization essentially refers to the explanation of a concept making use of visual material as a primary means of communication. One of the objectives of the Sustainable Community Design web site is "the development of a visual and sustainable design vocabulary"[4] to be used as a starting point for discussions, providing all participants in a design process with a common set of basic references.

1.1   Background:

Sustainable Community Design has been proven in many studies over the past decade to offer a possibility for the development of sustainable human environments.   These communities minimize traditional development's negative impact on the environment without reducing the quality of life of those who inhabit them. Researchers such as Calthorpe, Epp, Lyle, Perks, Perron, Todd, Van Der Ryn, Van Vliet and Wilton-Clark have produced research and resource documents that serve as educational tools for designers, clients and policy makers, who then take this research from the

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[3] *Visualization   techniques,*
http://bamboo.mluri.sari.ac.uk/`jo/litrev/chap3.html,   08/10/97
[4] Perron, R., Epp, E. Application for Housing Research Grant, CMHC 1995.

theoretical to the actual. There have been numerous in-depth studies which address all levels of sustainable community design. Issues relating to the home, landscape, city, region, and the interrelationship between these have been carefully investigated and quantified. The next step in the process is the mass communication of these studies in order to help create a public dialog of the issues and opportunities involved in Sustainable Community Design.[5]

In 1993 Epp, Perron et. al undertook to communicate in a multimedia format the issues of Sustainable Community Design with their multimedia document entitled *Computer Visualization Technologies to Evaluate Design Alternatives for a Sustainable Community with Reference to Edgemont, Calgary, Alberta.* The Sustainable Community Design web site builds and expands on that work in three areas:

• Type and depth of multimedia investigation
• Volume and depth of information delivered in a multimedia format
• Delivery of the information to an augmented user base.

These expansions have been achieved by employing additional multimedia technologies to the ones employed in Epp and Perron's work; through the addition of vastly increased text and graphic information; and through the publication of the work on the World Wide Web portion of the Internet.

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[5]Perron, R., Epp, E. Application for Housing Research Grant, CMHC 1995.

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The organizational structure of the information in the web site is based on the 150+ features of sustainable community design identified by Perks and Van Vliet in their 1993 work *Assessment of Built Projects for Sustainable Communities* [6]. The 150 features are divided into the following 9 categories of investigation:

- Building Ecology
- Land Use / Landscape Ecology
- Community Design
- Energy
- Transportation
- Water and Sewage
- Waste and Recycling
- Community Management
- Economic Viability

These nine categories were used as the organizational structure for the two main sections of the web site, the **Design Features** section and the **Case Studies** section. Through these two sections, and their interconnections, the authors of the SCD web site planned to achieve their objective. This was to of demonstrate how sustainable community design research, married with internet technology, could be used as an educational tool, before the design phase is entered, to help the designer and client explore the issues involved and illuminate their discussions.

The medium chosen for the presentation of this information was digital multimedia and the World Wide Web. These two technology

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[6]Perks, W. T. and D. Van Vliet. 1993 *Assessment of Built Projects for Sustainable Communities.* Canada Mortgage and Housing, External Research Program, Ottawa. Draft

sets provided unique opportunities for the communication of the complex and interwoven concepts inherent to sustainable community design.

1.2   Introduction:

In 1987 the Brundtland commission's report to the United Nations entitled *Our Common Future* gave the following definition to the concept of **Sustainable Development**.   "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[7]

Shortly thereafter the term **Sustainable Design** was coined referring to design processes which took into account issues of sustainable development.[8]   The factors that sustainable design largely address are the reduction of energy consumption and wise / appropriate resource use.   Sustainable Design attempts to address these factors through the design process.

Sustainable Community Design was defined as a concept in 1986 with the release of Van Der Ryn and Calthorpe's work entitled *Sustainable Communities: A new design synthesis for cities, suburbs and towns..*   This concept began to be investigated in greater detail during the late 1980's.   According to William T. Perks sustainable

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[7]Brundtland, *Our Common Future: The world commission on Environment and Development*   Oxford University Press, New York, NY. 1987

[8]Hsin, Robert *Guidelines for Principles for Sustainable Community Design,* http://fcn.state.fl.us/fdi/e-design/online/9607/thesis/thesis.htm,   2/10/98.

community design "refers essentially to a practice of planning, designing, building and managing, and the social-economic development of communities following the precepts of sustainable development set out by the UN Brundtland Commission in 1987."[9]

Sustainable   Communities are those which employ the standards of sustainable development (resource and energy standards) as well as design theories which endeavor to make the physical and social environments of the community more sustainable than is the current practice.   These new community forms incorporate a greater overall population density, a pedestrian centred atmosphere, with increased facilities for cyclists, "walkable" streets usually on a grid system, fewer cul-de-sacs and bays and smaller set-backs, among other features.   Several researchers such as Sym Van Der Ryn, Peter Calthorpe, William Perks, Robert Kirby, Andrea Wilton Clark, and David Van Vliet have done substantial work on the analysis and planning of theoretical "sustainable communities".

Beginning in the early 1990s several prototype communities were built in northern European and Scandinavian countries.   These communities have been subject to studies such as Perks and Van Vliet's *Assessment of Built Projects for Sustainable Communities*[10], which has lead to the further refinement of the concept of sustainable community design.   This refinement formed the basis for

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[9]Perks, William T.   *http://www.cadlab.umanitoba.ca/la_www/sustainable/ intro01.htm*   Jan 15th, 1998.

[10]Perks, W. T. and D. Van Vliet. 1993   *Assessment of Built Projects for Sustainable Communities*.   Canada Mortgage and Housing, External Research Program, Ottawa. Draft

such projects as the *Edgemont II*[11] proposal for Calgary and the *Sustainable Canadian City in the Year 2020: A History of Beginnings at Willmore and Calgary*[12] report.

The virtual absence of built examples of sustainable communities in Canada seems to indicate a general lack of circulation of the research materials that have been developed over the past decade surrounding issues of Sustainable Community Design.   This was a major impetus for the development of the SCD Web Site.

In the mid 1990s Epp and Perron, of the University of Manitoba, and Perks and Wilton-Clark, of the University of Calgary, collaborated on two projects which were intended first, to communicate the concept of sustainable community design to the general public[13], and second, to gauge the public's reaction to it[14].

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[11]Perks, W.T Kirby, R., Wilton-Clark, A. 1995 *Edgemont II: A Study in Sustainable Community Form.*   Centre for Environmental Design Research and Outreach (CEDRO), Faculty of Environmental Design, University of Calgary.

[12]Perks, W.T. Van Vliet, D. R.."Sustainable Canadian City in the Year 2020: A History of Beginnings at Willmore and Calgary"; in *Vision of Life in a Sustainable 21st Century Canadian City.*   Ottawa: Centre for future Studies in housing and Living Environments, Canada Mortgage and Housing. 1993

[13]Perron, R. Epp, E.   *Computer Visualization Technologies to Evaluate Design Alternatives for a Sustainable Community with Reference to Edgemont, Calgary, Alberta.*   A HyperMedia Document, Ottawa: Canada Mortgage and Housing Corporation (CMHC), the Faculty of Architecture, University of Manitoba. 1995

[14]Perks, W.T., Wilton-Clark, A., 1995 *Testing Consumer Receptivity to Sustainable & More Affordable Suburb Design in Calgary.*   Canada Mortgage and Housing, External Research Program, Ottawa. Final Report.

By employing *Macromind Director*™ software for the *Macintosh*™ computer, Epp and Perron created a multimedia presentation / questionnaire that was used as a tool to illustrate some of the concepts inherent in Sustainable Community Design.   The presentation then questioned the participants in a survey regarding their responses to the information given.

Perks and Wilton-Clark developed the survey in collaboration with Epp and Perron, then presented the document to two groups of users in Calgary.   One group was made up of residents of Edgemont, an existing Calgary suburb, and the other group was made up of civic employees from other Calgary neighbourhoods.   The research subjects' responses showed a high level of receptivity to the concept of Sustainable Community Design, where "A majority of the 62 participants responded very favorably to almost all of the 32 questions"[15] It is important to note that while the response was favorable, the sample size, while being statistically significant, was very limited[16].

By the spring of 1996 the development of the World Wide Web as a communication tool afforded an opportunity to reach a much larger and more diverse audience than the 60-70 individuals that were reached through *Computer Visualization Technologies to Evaluate*

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[15]Perks, W.T., Wilton-Clark, A.,   *Consumer receptivity to Sustainable Community Design,* Faculty of Environmental Design, University of Calgary, 1996 p. v.
[16]Perks, W.T., Wilton-Clark, A.,   *Consumer receptivity to Sustainable Community Design,* Faculty of Environmental Design, University of Calgary, 1996 p. ii.

Design Alternatives for a Sustainable Community with Reference to Edgemont, Calgary, Alberta. The WWW also provided an opportunity to communicate more detailed information about sustainable community design. The SCD web site was conceived as a way to utilize the increasing popularity of the World Wide Web and its inherent graphic nature, to deliver a compelling visual argument as to why home buyers, developers and designers should be looking at sustainable community design as an option to meet their future housing needs.

There are several reasons why the World Wide Web was chosen as the medium for the communication of the content of the Sustainable Community Design web site. First, the researchers desired to continue the work that was begun by Epp and Perron in 1993. The World Wide Web as it existed in 1993 did not offer substantial opportunities for communicating information in a multimedia format, and was not yet the mass communication tool it has come to be. It was therefore not an option that the researchers could have effectively employed at that time.

The World Wide Web currently offers all of the same multimedia features that were available to the researchers in 1993 through *Macromind Director* TM as well as some more advanced features. It also provides a way of distributing the information in a digital form. Wide-scale distribution of the information was not part of the 1993 project, and therefore was not an issue addressed at that time.

The World Wide Web offers many different features and levels of interaction not available through traditional means of publication. Audio and video, as well as internet specific technologies including QuickTime VR, VRML, interactive forums and chat rooms can provide the user with a multi-faceted learning experience. These technologies can also give the user the chance to interact with the developers of the information and other interested individuals. As will be explained in a later chapter, the World Wide Web allows for user defined non-linear navigation of the information presented. This can benefit the user by allowing them to control which information they access and in what order it appears.

A further benefit of publishing information via the World Wide Web is the cost of publication. Because there are no printing and distribution costs, publishing via the World Wide Web can be quite inexpensive. It also allows for a level of global distribution of information that would not normally occur except in the case of an international best seller. This allows small publishers, with limited but geographically dispersed clientele, to reach more interested parties than would be possible through traditional publication methods. Hypertext Mark-up Language (HTML) is the programming language on which the World Wide Web is based. Due to its simplicity most researchers would be able to quickly learn the basics necessary for web publication. Software has now become available which makes WWW layout and publishing even more accessible than in the recent past. Software such as *Claris Home Page* TM and *Adobe Pagemill* TM function similarly to current desktop publishing and

word processing applications.   The publisher can format information for a web page without ever having to type in programming codes.

Updating and publishing new editions of a work is also simplified with web publishing.   Due to the fact that the information being distributed is in a digital format the content of the files can be changed on the local web server, and then redistributed.   With traditional paper publishing, this would be akin to collecting all copies of the published document, removing the pages that need changes, putting in the new information and sending them back out to the users.   On the World Wide Web this process can be achieved in a matter of seconds.   The next time the user accesses the site they will receive the most up-to-date version of the information.

Finally, the World Wide Web allows information to be published while it is "in progress".   The Sustainable Community Design web site has had over 6000 visitors since its inception in June of 1996.   Using traditional publication methods, those visitors would not yet have seen the information generated.   The web site is still a work in progress.   In any other medium the information would not likely have been published in a preliminary state.   Consequently, the designers of the web site would not have had the benefit of feedback that has been received from the visitors and reviewers of the web site.   With traditional means of publication the work must be a "fait de complete" before it appears in book form or as an article in a journal.   This means that discussions and recommendations by the

wider community cannot be incorporated into the work unless a further edition is developed.

One major drawback to web publication is the fact that, although the WWW is becoming more available in schools, libraries, and universities, it still is not a fully accessible communications mechanism.   Users need costly computer technology and an internet subscription in order to access the information, as well as the research skills to find it.   Individuals who do not have access to these resources or skills will be unable to participate.   This denies that these individuals may have constructive input to contribute to a discussion about sustainable community design.   A true sustainable community would seek out and include the inputs and diversity of all of these people as well as many others.

The WWW was chosen as the publication mechanism for the SCD web site because of factors that have been outlined in this introduction and will be explained further in the following chapters.   Although the WWW is a not an entirely accessible communications system, it is still more accessible to the general public than the system of government and university libraries in which most sustainable community design information has traditionally resided.

Chapter 2

2.0 The Internet and Visualization Opportunities:

2.01 The Internet:

The Internet forms the foundation for the development and distribution of the Sustainable Community Design web site that is the focus of this research. Although the numbers in the following quote have changed since 1994, in some cases by more than an order of magnitude, the basic information remains current.

> "*The Internet is a collection of more than 10,000 interconnected computer networks around the world that make it possible to share information almost instantly. The networks are owned by countless commercial, research, governmental, and educational organizations and individuals. The Internet allows the more than 1.5 million computers and 10 millions users of the system to collaborate easily and quickly through messaging, discussion groups, and conferencing. Users are able to discover and access people and information, distribute information, and experiment with new technologies and services. The Internet has become a major global infrastructure for education, research, professional learning, public service, and business and is currently growing at the rate of about ten percent per month.*" [17]

2.02 The World Wide Web (WWW):

On the foundation of the Internet sits the World Wide Web. As an ever expanding part of the Internet, the WWW largely dictates the tools that are available for the formatting and distribution of all types of information on the Internet. Coined in October 1990, the

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[17]*FYI on Questions and Answers: Answers to Commonly Asked "Primary and Secondary School Internet User" Questions*
http://chs.cusd.claremont.edu/www/people/rmuir/rfc1578.html   22/02/94

phrase World Wide Web describes a way of formatting information to be transmitted across the Internet. The key components of this format are hypertext linking, and a point and click graphic user interface which displays text and images. The Internet had previously been able to display only text. In 1993 The National Center for Super-Computing Applications (NCSA), at the Urbana-Champaign campus of the University of Illinois, released working versions of its *Mosaic*™ client software for all standard computer platforms[18] (Macintosh, PC/UNIX). *Mosaic*™ enabled different computer platforms to read and interpret the same information in the same way. Thus, the WWW became universally accessible to all standard computers, independent of their operating system. The creation of the *Netscape*™ client in 1994 (by University of Illinois graduates), and the subsequent development of HTML 2.0, 3.2, and most recently 4.0, Java, VRML, RealAudio, QuickTime VR, streaming video, and a variety of other technologies and plug-ins, transformed the WWW from a dual media platform to a multimedia platform. This platform successfully incorporated text, imagery, animation, video, sound and interactivity by the fall of 1996.

2.1 Programming:

2.11 Hypertext Markup Language and the WWW:

The WWW is based on the interpretation of HyperText Markup Language (HTML) files by web client software located on a users computer or Local Area Network (LAN). This varies from the

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[18]*Netcoder*
http://www.netcoder.com/english/conseils/histwww.htm   1996

previous way of using the Internet which involved setting up the user's machine to function as a dummy terminal that accessed information remotely from a mainframe server. From the user's perspective, HTML facilitates an interface with the Internet analogous to that of Windows 3.1 on a DOS based PC. HTML combined with client software (web browsers) allows users a point and click text and graphic interface to what was, until the creation of HTML, a text based operating system.

The case study for this practicum project, the Sustainable Community Design Web Site, was created using HTML 3.2. HTML 3.2 is made up of a series of standard programming codes that are recognized by all of the major developers of client software. Developers working for the leading client software companies have also created browser specific HTML codes. These codes are only recognized by the software they were designed for, and not by other software. This can cause problems for developers due to the fact that they have no control over the type of client software with which their web site will be accessed. Limiting the programming on the SCD web site to HTML 3.2 protocols ensures that the site has a standard appearance on all of the current web client software avoiding the problems caused by client specific codes. Figure 1 on the following page is an illustration of the HTML codes involved in one of the files that make up the SCD web site. The HTML codes all appear in small text inside < and > brackets. Figure 2 indicates how the client software interprets the HTML codes and displays the information.

```
<html>
<head>
<title>ECOLONIA: COMMUNITY DESIGN</title>
</head>
<body  VLINK="#229911"  LINK="#004400"  bgcolor="#ffff99">

<table  width=100%><tr><td><img  src="gifs/ecotitl.GIF"><p><td  align=right>
<img  src="gifs/1of3.GIF"><br><br>
<tr><td  valign=top>


<B>COMMUNITY DESIGN:</B><br><br>


The  concept  plan  for  Ecolonia  was  developed  by  Lucien  Kroll,  well
known  for  his  advocacy  of  an  urban  development  form  that  fosters  a
relationship  between  residents  and  their  environment.   His  ideas  are
based  on  principles  of  natural  expansion  where  a  community  will
accommodate  the  needs  of  the  residents  and  is  of  a  human
scale.<br><br>


The  planning  and  design  team  was  headed  initially  by  Kroll,  a  Belgian
architect,  commissioned  by  the  Bouwfonds  Woningbouw  to  produce
the  site  plan.   He  later  withdrew  from  the  implementation  process
due  to  delays  and  constraints  arising  from  technical  and  regulatory
barriers  in  the  municipal  administration.


<td>
<A  HREF="foot177.htm"><img  src="gifs/eco015.JPG"  border=0></A><br>

<tr><td  colspan=2>
<A  HREF="ecoindx.htm"><img  src="gifs/main.gif"  border=0  alt=main></A>
<A  HREF="../../contents.htm"><img  src="gifs/home.gif"  border=0  alt=contents></A>
<A  HREF="eco202.htm"><img  src="gifs/links.gif"  border=0  alt=links></A>
<A  HREF="../../casestud.htm"><img  src="gifs/cases.gif"  border=0  alt=case  studies></A>
<A  HREF="../../design.htm"><img  src="gifs/design.gif"  border=0  alt=design  features></A>
<A  HREF="ecoindx.htm"><img  src="gifs/backward.gif"  border=0  alt=back></A>
<A  HREF="eco0151.htm"><img  src="gifs/forward.gif"  border=0  alt=forward></A>
</table>
</body>
</html>
```

Figure 1.   An example of HTML 3.2 programming from the Sustainable Community Design Web Site[19]

Ecolonia, Netherlands

COMMUNITY DESIGN:

The concept plan for Ecolonia was developed by Lucien Kroll, well known for his advocacy of an urban development form that fosters a relationship between residents and their environment. His ideas are based on principles of natural expansion where a community will accomodate the needs of the residents and is of a human scale.

The planning and design team was headed initially by Kroll, a Belgian architect, commissioned by the Bouwfonds Woningbouw to produce the site plan. He later withdrew from the implementation process due to delays and constraints arising from technical and regulatory barriers in the municipal administration.
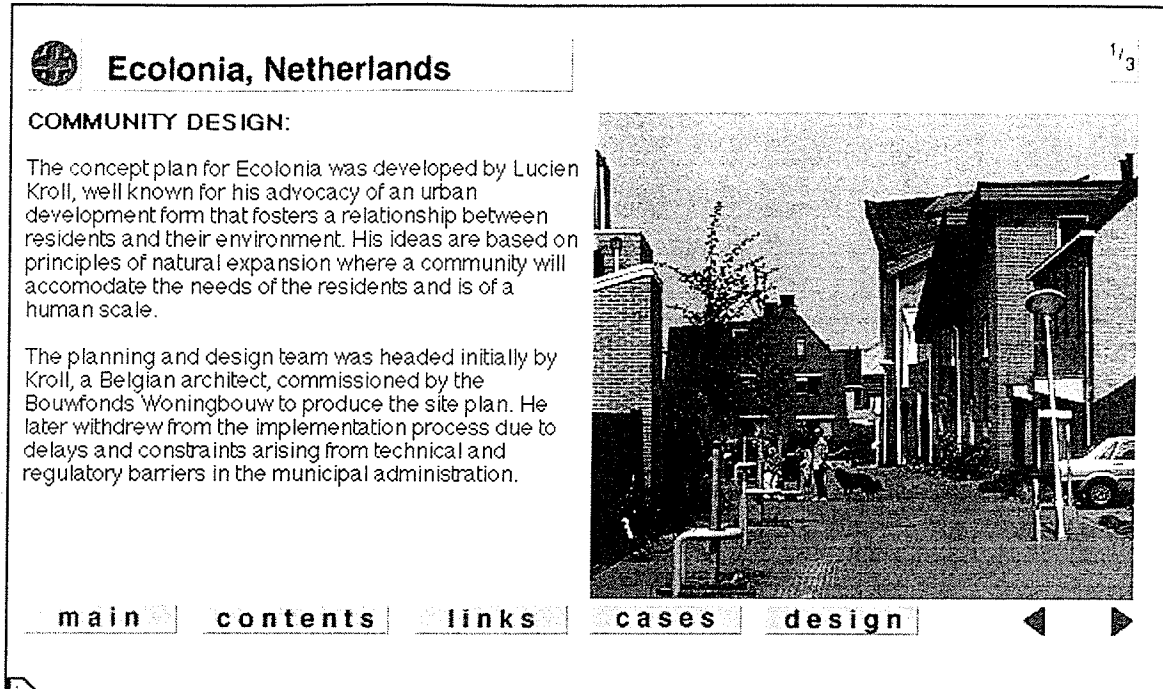
main | contents | links | cases | design

Figure 2. The graphic format [20] derived from the interpretation of HTML codes listed in Figure 1.

2.12 Hypertext:

HTML facilitates the programming and distribution of Hypertext over the WWW. Hypertext as a concept was developed by Theodore H. Nelson in the 1960's[21] . The following definitions were developed by George P. Landow for his book *Hypertext: The convergence of contemporary critical theory and technology.*[22]

Text: fixed text that only has a "read" function, as part of a traditional linear narrative structure.

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[20]*The Sustainable Community Design Web Site*
http://www.cadlab.umanitoba.ca/la_www/sustainable/cases/ecolonia/eco015.htm
[21] George P. Landow *Hypertext: The convergence of contemporary critical theory and technology.* The Johns Hopkins university Press Baltimore MA 1992. p. 4
[22] George P. Landow *Hypertext: The convergence of contemporary critical theory and technology.* The Johns Hopkins university Press Baltimore MA 1992. p. 4

Hypertext: fixed text that also has a navigation function allowing the reader to determine the flow or direction of the narration

Hypermedia: a catch all term that refers to text, still images, video, animation and sound files that along with their traditional function also have a navigation function that allow the reader the flexibility to determine the navigational flow of the "document".

Note: Landow uses the terms hypertext and hypermedia interchangeably.

HTML is a simple text-based, programming language that allows for the development of non-linear navigation opportunities through the programming of hypertext or hypermedia links. HTML allows for the display of text and still images as well as allowing for the addition of higher level programming languages to add interactivity, sound, animation and video. The World Wide Web portion of the internet provides a delivery mechanism for HTML files, that can, depending on file contents and server/modem speed, be accessed from almost anywhere in the world, in seconds.

2.13 HTML vs. Desktop Publishing:

As HTML evolves, its complexity increases to meet the demands of programmers seeking more power and flexibility in the formatting and presenting of information via the WWW. Currently HTML is neither as powerful nor as flexible a presentation media as the standard desktop publishing software such as *Adobe Pagemaker*TM or *Quark Express*TM. One example of this inflexibility if the fact that text and images cannot currently be overlapped in HTML (an important layout tool in desktop publishing), without creating a fixed graphic in

a secondary software program such as *Adobe Photoshop*TM. Once such a graphic has been created, editing the information in that graphic is a time consuming and technology consuming process.

One current major drawback of HTML is that in order for it to accommodate various sizes and types of computer monitors, many of its programming codes are relative codes. These codes respond differently depending on the screen size of the machine on which they are being displayed. Relative codes result in web pages that appear differently on different computers. This can interfere with the communication of information as intended by the web site author. Many authors address this problem by offering instructions to the users of their web sites on how to format computers / monitors to view the web site for maximum effect. HTML 4.0 codes combined with client software packages such as *Microsoft Explorer*TM 4.0 or *Netscape Communicator*TM 4.0 can now be instructed to display a certain font size and type in the user's browser window. Earlier versions of client software and HTML did not have this capability. HTML 3.2, which the SCD web site is based on, made only one font was available at a time, which was designated by the user, not the web site developer.

2.14 Web Based Hypermedia Vs CD-ROM Based Hypermedia:
There are several important differences between web based hypermedia and CD-ROM based hypermedia. The first difference is speed of access. Traditionally web based hypermedia is accessed through a modem or network connection. It takes longer to transfer

information from the web to a user's computer than it does to access the same information from a local CD-ROM or hard drive. This difference in transfer speed leads to a reduction in the size and type of files that are appropriate for distribution via the web. High quality graphic information, and especially video, has become a standard part of most multimedia CD-ROM's. However, it remains a relatively rare format for distribution on the WWW due to the size of the files involved.

The programmer of CD-ROM based hypermedia has control over the appearance of the screen, font sizes and types, as well as window size, and even screen resolution. In contrast, the programmer of web based hypermedia does not yet have this kind of control.

CD-ROM based hypermedia is currently limited by the size of a CD-ROM disk, which is approximately 650 megabytes. The size of web based hypermedia products are not limited in this way due to the fact that a web site can be stored on multiple machines in multiple locations and still be seamlessly connected through hyperlinks.

Web based multimedia provides opportunities for users anywhere in the world to access the information in seconds. CD-ROM based multimedia must be copied and distributed in the same way as traditional publication methods. Updates to web based multimedia are immediately accessible to the user after they have been copied onto the web server. Updates to CD-ROM based hypermedia must be accessed in the same manner as a new edition of a book. A copy of

the new work must be obtained in order to access the changes. There is virtually no cost to distribution with web based multimedia. CD-ROM based multimedia has some publication and distribution costs associated with it.

Web based hypermedia affords the possibilities for interactions and communication with the authors and other interested individuals through facilities such as on-line chat rooms and forums. Forums allow users and the authors of the site to post questions and answers on-line in topic-related streams. Chat rooms allow for real-time interactions between participants. Questions, comments and answers appear on each user's screen as they are being entered. This allows a conversation to occur between interested individuals in dispersed locations. There is currently no similar interactive technology available through CD-ROM based hypermedia documents.

2.2 Software:

2.21 Client Software:

Client software, commonly called web browsers, refers to software that is present on a user's computer for the purpose of navigating the World Wide Web. Two current client software packages for this purpose are *Netscape Communicator*™ and *Microsoft Internet Explorer*™. Client software is used to access and interpret HTML files from the World Wide Web, as well as the files that are referenced by the HTML files such as graphic and sound files.

2.22 User Defined Interface:

The user defined interface allows users some control over the presentation of material within the client software package. Users can adjust the size and style of the text, as well as the linking colours of the hypertext links and the browser's window size. Users can choose to turn off the images and download text only. They can also choose the size of the window in which the information is displayed, as well as the resolution that their monitor will display (if the monitor is new enough). This level of control, while not complete can have a large effect on the legibility of the information being distributed by the web site. One direct benefit of this flexibility is for users with visual impairments who are free to increase the text size on the web page to one which suits them best.

The newest versions of the most popular client software packages allow users to download and view within the browser window many different file types, including graphics, sounds, and animation, as well as integrating e-mail and newsgroup functions. A new programming language, Java script, is quickly allowing web site developers to override, at least initially, the client software settings specified by the user. This begins to give programmers and developers similar programming powers as are offered by most CD-ROM based hypermedia documents developed with software such as *Macromedia Director*TM .

2.23 The "Browser Safe Colour Palette":

*Netscape Communicator*TM and *Microsoft Internet Explorer*TM share a common colour display palette. The 216 colours that are defined as

part of this "Browser Safe Colour Palette"[23] appear identical on each browser. This is important to designers working on or designing for machines displaying only 8 bit colour. Colours not defined as part of the palette will not be displayed as solid blocks of colour, on these machines, but instead will be dithered. Dithering is a process that the computer undertakes to match colours that the monitor or the video card cannot create. The computer displays pixels of different colours adjacent to one another so that if viewed from a sufficient distance the eye of the user will combine the colours together to form a third colour. An example of dithering is as follows: The computer cannot replicate a certain colour of purple, so it replaces the purple area of the graphic with a series of blue and red pixels. This effect can look radically different from one client software to another, potentially interfering with a desired visual effect[24]. One of the major drawbacks of the browser safe colour palette is that the colours are not consistent from platform to platform. A colour displayed on a *Macintosh*[TM] computer will not appear the same on a *Windows '95*[TM] based machine even if the design adheres to the palette. The Browser Safe Colour Palette is only an issue for designers working on or designing for machines that can display only 8 bit, or 256 colours, with the advent of 16 bit (thousands of colours) and 32 bit (millions of colours) PC's dithering has become a non issue.

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[23]*Coloring Web Graphics: The Definitive Guide to Color on the Web*
http://www.lynda.com/hex.html   25/06/98
[24]*Coloring Web Graphics: The Definitive Guide to Color on the Web*
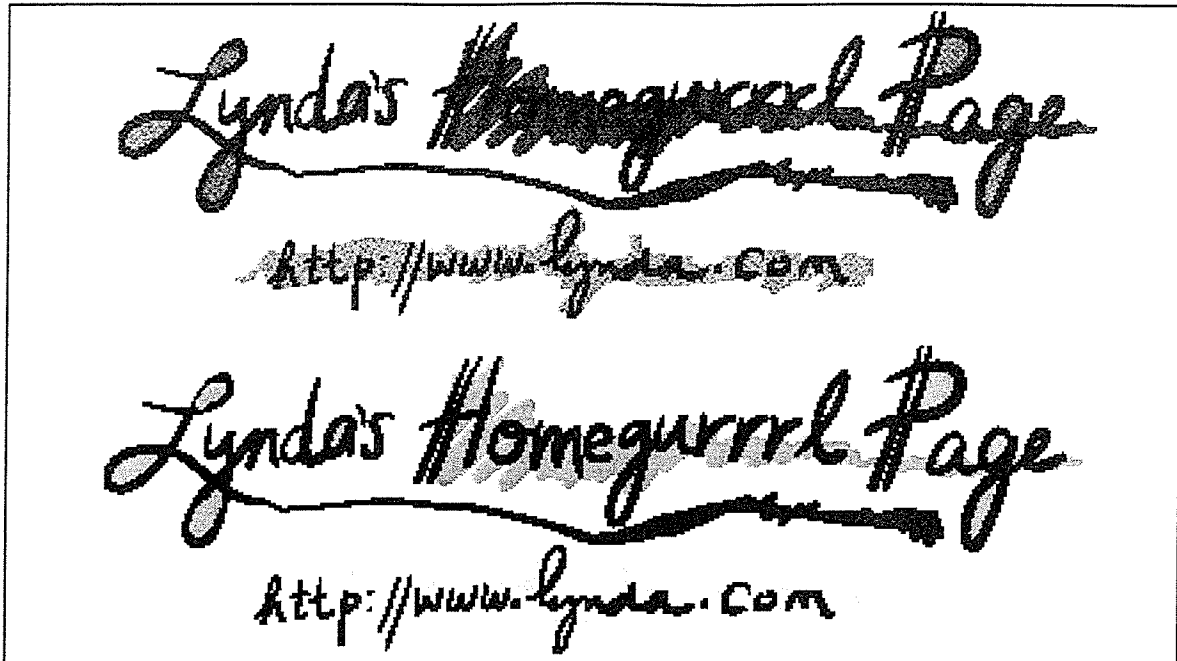http://www.lynda.com/hex.html   25/06/98

Figure 3. An illustration of the browser safe colour palette.[25] The graphic on the top was generated using colours not in the palette, notice the hatching and dithering on the image. The bottom illustration adheres to the palette, and does not encounter the same problems.

2.24 Image File Types:

There are a number of graphic file types available for retrieval and display using client software. All of the file types discussed here offer different opportunities and limitations that will be discussed further in Chapter 4. Each of these files are known as cross platform compatible, i.e. any type of computer accessing the Internet can download and display them.

2.241 Graphic Interchange Format Files (GIF):

GIF files are a type of compressed data file developed by Compuserve in the early 1990s. These files are the basic building

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[25]*Flat color Illustration Test*
http://www.lynda.com/dwg/flatdither.html   27/08/98

blocks for communicating graphic information on the WWW. The GIF image format works best with images that include 256 colours or less (the standard Windows 3.1 display at the time). If an image containing more that 256 colours is saved as a GIF file, then the colour palette of the image will be reduced to 256 colours. This generally reduces the quality and legibility of the image. The data compression rate in a GIF file depends on the file's complexity and the number of colours in the file. With fewer colours and less complexity greater data compression can be achieved. This results in reduced memory requirements for the image, which in turn increases transfer speed over the web.

2.242 Transparent GIF Files:

A transparent GIF file allows the background information of a web page to show through the image. Visually this can be a very useful tool, helping to blend non-rectilinear images into their backgrounds.
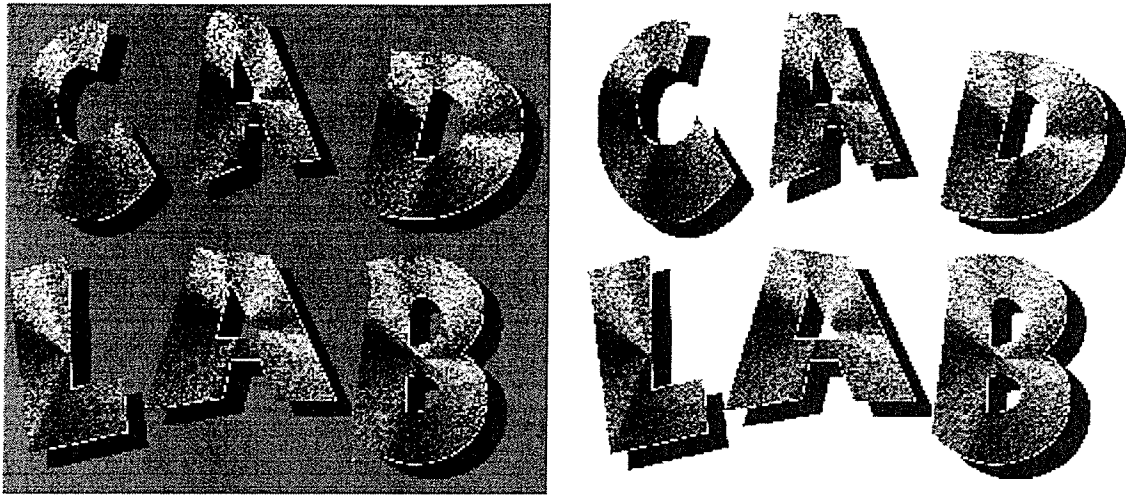
Figure 4. The graphic[26] on the left is a standard GIF on a grey background, the graphic on the right is the same file, but the grey background has been made transparent allowing the contents of the image to blend into the white background of the page.

2.243 Animated GIF Files (GIF89a):

GIF89a or animated GIF can include multiple layers of information imbedded into one file. The computer interprets these layers by flipping through the information like a slide show or movie type animation. Depending on the speed of the Internet connection, animated GIFs can appear as short video or animation sequences, thus communicating more information in the same amount of screen "space" as a traditional GIF file but with a correspondingly larger memory requirement. These files share the same 256 colour restrictions as a standard GIF file, as well as the same data compression ratios.

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[26]*CadLab*
http://www.cadlab.umanitoba.ca/cadlab.html   27/08/98

2.244 Joint Photographic Experts Group Files (JPEG):

JPEG files, which along with GIF files represent the two dominant graphic file types currently used on the Internet, are a type of compressed PICT or Picture file. The compression rates that can be achieved with a JPEG file are greater than those of a GIF for complex images displaying more than 256 colours such as photographs. JPEG files offer the user a series of options for file compression. When saving an image, the user can chose from four image quality levels, which range from low, which has correspondingly the highest level of compression, to maximum, which has the lowest level of compression. JPEG images are capable of handling thousands or millions of colours whereas GIF images cannot display more that 256 colours. This makes JPEG files the best option when displaying photographic information on the WWW.

Figure 5. A comparison between the image quality of a photograph[27] saved in GIF format (left) and the same photograph saved in JPEG format (right). Note that the GIF image appears pixelated, where the JPEG image contains much smoother transitions from one colour to the next.

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[27]*The Sustainable Community Design Web Site*
http://www.cadlab.umanitoba.ca/la_www/sustainable/design/landuse/land0034.htm
27/08/98

2.245 QuickTime Virtual Reality (VR):

QuickTime VR is a file type that is formed from the splicing together of a series of photographic images into a 180 or 360 degree 2-dimensional panoramic image. QuickTime VR allows this image to then be scrolled through by the user giving them a 360^0 view of a site or landscape. This communicates information in a way that would be hard to achieve with a series of individual images. One feature of QuickTime VR is user control. Through the manipulation of the mouse, users can determine which part of the image is on the screen and can zoom in and out. This level of control can help the user better examine the contents of an image, or understand spatial relationships between objects in a landscape. An illustration of this technology can be found at: *http://www.umanitoba.ca/about/map/*

2.246 Virtual Reality Modeling Language:

Another graphic technology available on the web is Virtual Reality Modeling Language (VRML). VRML allows for the creation of virtual landscapes within the computer. The look and feel of VRML is similar to that of QuickTime VR. With VRML the user can navigate a computer generated 3 dimensional file, with depth, as well as height and width. This is in contrast to QuickTime VR, in which the user is looking at a photographic panorama image, but has no ability to "enter" the image.

The difference between the two file types is a matter of perspective. In a QuickTime VR file the user is in a <u>fixed position</u> in the centre of

a 360 degree image, or in front of an image that is less than 360

degrees. With VRML the user is in the centre of a 360 degree image,

but their location within that image is <u>not fixed</u>. The user can move

around and explore the contents of the file from multiple angles. The

other difference between the two file types is the kind of

information they contain. A QuickTime VR file is almost exclusively

generated from a series of photographs, whereas a VRML file is most
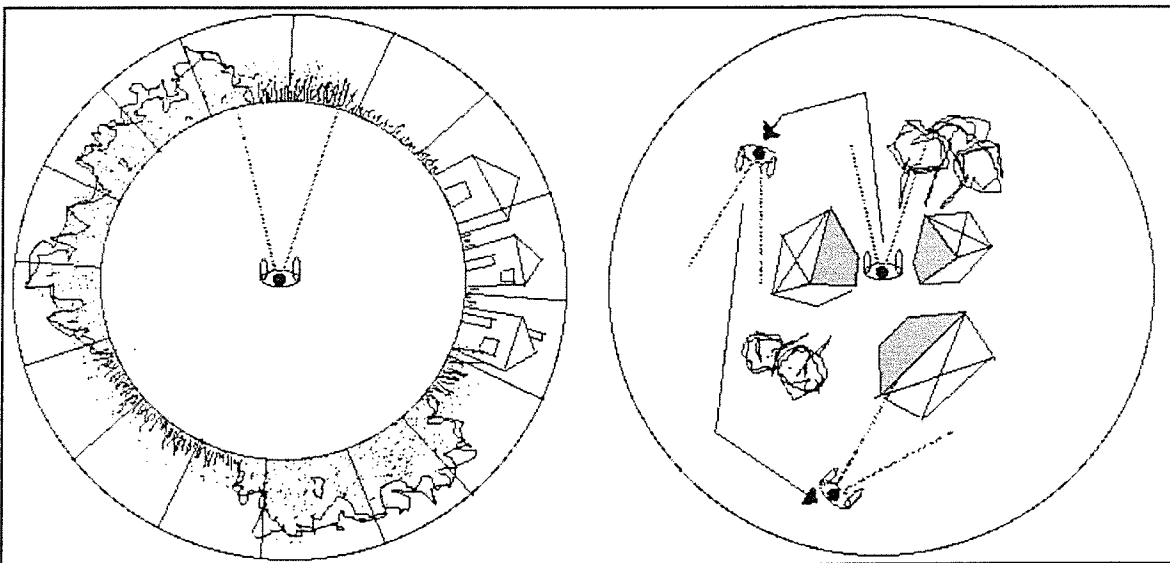
often a completely computer generated file.

Figure 6. Graphic illustrations of the format of a QuickTime VR file (left) and a VRML file (right)

2.247 Video:

Video, like QuickTime VR, is a way of splicing together images.

However, with video the only control the user has is to stop and start

the file. They have no control over the screen content as they do

with QuickTime VR. One of the major advantages to video over any

of the file types discussed thus far is the possible inclusion of audio

files with a video clip. The presence of an audio clip narrating or

explaining the significance of the video image can be extremely effective in helping to communicate information.

2.248 Image Options and Visualization:

GIFs, JPEGs, Animated GIFs, QuickTime VR, VRML and Video are not the only ways of presenting graphic information via the WWW. New ways are being developed almost every day. However, these six formats do represent the current standard formats in use on the WWW. Helping the user visualize and interpret information may involve the interplay of these six file types and may also include text information, audio clips and hypertext linking. Text information, like an audio clip, is useful as a supplement to the information communicated by the imagery. Hypertext linking relates information together from one file to another.

2.3 Hardware:

2.31 Video Display Units (VDUs):

In May of 1996, when the Sustainable Community Design web project was begun, the industry standard VDU (monitor) for Macintosh and IBM compatible PCs was a 14" - 15" colour monitor displaying 640 x 480 pixels and 256 colours. This translated into a screen resolution of 72 pixels x 72 pixels per inch. In contrast, text output on a standard laser printer is at a resolution of 300 x 300 pixels per inch, or higher. Images in higher quality magazines can range from 600-2400 pixels per inch. This difference in resolution has a large impact on how much information can be legibly presented on a computer screen. Increased resolution results in a

decreased pixel size on the monitor. Decreased pixel size allows more pixels, i.e. more information, to be included in an image. As well the image will appear less "pixelated", or appear more sharply on the screen.

2.32 Visual Fatigue:

Visual Fatigue is a factor that limits the amount of information that can be effectively communicated during a learning session using a computer. Visual fatigue refers to the temporary phenomenon of the user's eyes getting "tired" and/or having trouble focusing on the information on the screen. Visual Fatigue is one of several factors which will reduce the amount of time a user will spend accessing digital information. It also has an effect on how much of the information seen by the user is actually processed and understood.

The backlit screen of the computer monitor can be a major contributing factor to visual fatigue. Other factors include flickering monitors, glare[28], blurred text and images, and low contrast between text and background colours.

The only one of these factors that can be controlled by the web site designer is the level of contrast between the text and background colour. All other factors are hardware related and thus the designer has no control over them.

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[28] *"Glare is indisputably linked to subjective reports of visual fatigue when interacting with a VDU.* [video display unit] *The studies show that the relationship of glare effecting reports of visual fatigue to be both statistical significance"*
http://lattanze.loyola.edu/lattanze/research/wp0393.016.html

2.33 Network / Modem Speed:

Network / modem speed, which controls the amount of time it takes to download information from the internet to a user's machine, is a necessary consideration when designing web pages. It is especially important for pages that include large quantities of graphic information. Personal experience suggests that users will not be willing to wait very long, typically not more than 10-20 seconds[29], for a web page to be downloaded to their machine. If it takes longer than this to download the information, the user is liable to become frustrated and give up on the web site. Download time is also important, because many commercial users of the information, or their employers, are paying for their access time by the minute. This factor is also liable to increase their level of frustration with a slow web site. If this is repeatedly encountered, they may abandon the site, or the idea of using the WWW as a research tool. Some factors that affect download time are:

- processor speed of the server sending the files
- processor speed of the modem receiving the files
- quality of the telephone connection over which the files are being transferred
- file size
- processor speed of the computer receiving the files

The only one of these factors that the web page designer can easily affect is the file size.

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[29]This phenomenon has been observed by the author numerous times during the years 1993-1998 at the University of Manitoba's Education Computer Lab.

A rule of thumb is that no web page should contain graphics larger than 35k[30]. This size of file can be transmitted over the WWW to someone using a 28.8 baud modem at a speed of about 2k per second, in approximately 20 seconds. It is important to note that the 35k rule of thumb is only a guideline. With the advancements in modem speed (modem speed doubles approximately every 12-18 months) the rule is becoming less critical.

2.34 Scrolling:

In reviewing web sites that paired text with graphics, the authors of the SCD web site found that the legibility of the graphics and the text was lessened if the user had to scroll down through the text or images. Many web sites include images that cannot fully be viewed on the 640 x 480 screen without scrolling. This is partly due to sites being designed to the new 800x600 monitor resolution standard, but being viewed on a 640x480 monitor. It is also partly due to poor or sloppy design. This format requires the user to keep the text and the images in mind as they scroll down the page to the end. This may be particularly difficult for users for whom the material is new. It is therefore advantageous, particularly on educational web sites, to display text and the images that relate to them on the screen at the same time.[31] Such a format should also preclude the appearance of the scroll bars on a web page which in turn provide less on-screen visual distractions to the user.

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[30]Helen Bochonko, Coordinator of the Education Computer Lab, University of Manitoba. Personal communication 1996

[31]Criswell, E. L., *The Design of Computer Based Instruction* Macmillan Publishing Company, New York. 1989 p.88

2.35 Publication and the WWW:

The WWW provides opportunities for the publication and wide scale distribution of HTML formatted information across the globe. HTML files that are "published" are distributed by a local server. This provides a mechanism for files to be constantly updated and re-distributed, allowing users access to the publisher's most recent edition. Web publishers have the opportunity to constantly re-publish and update information. This is in contrast to traditional means of publication as well as CD-ROM publications. With these methods after a document is sent to the printer, any changes that need to be made must wait for the next edition. In order to access those changes once the next edition is available the user must acquire another copy of the document. With a web site, the publisher only has to update an individual file on the web server. The new information is then accessible to all who subsequently visit the site.

Publishing via the web has the potential to be a faster process than traditional publishing, due to the fact that the printing and distribution portions of the process are essentially eliminated.

A further benefit to web publishing is that the work does not always have to be a finished product before it is made available to users. For example the SCD web site has received over 6000 visits since its inception in June of 1996, but it will not be completed until September 1998. By publishing work that is "in progress" on the

web researchers can solicit information, comments and input from other interested parties that have accessed their site. This allows for remote collaborations. It also reduces the amount of time a user has to wait between the time data is gathered and the time it is submitted for traditional publication.

One serious drawback of publication via the WWW, and the use of the WWW for research, is the fact that their is no jury of peers reviewing this information as occurs in most research and professional journals. This means that the user has to carefully assess for themselves the validity of the information being presented based solely on whatever supporting materials are provided by the publisher of the web site. This puts an added onus on the user and the publisher. In the case of the publisher, to be as thorough in the documentation of the research as they would need to be for publication in a Journal. In the case of the user to carefully weigh the validity of the information being communicated.

With the popularity of the WWW increasing each day, more and more users are logging on and looking for all types of information. By making information such as the Sustainable Community Design web site available on the WWW the authors are providing potentially thousands of interested parties access to information that previously would have had a very small circulation, through government or university libraries. The WWW also makes information immediately available to the users, who may previously have waited days, weeks or even months, depending on their location on the globe.

2.4 Summary:

- There are six dominant file types used to transfer graphic information digitally over the WWW, including: GIFs Animated GIFs, JPEGs, QuickTime VR, VRML, and Video.

- There are currently 2 dominant client software packages used to views HTML files with: *Netscape Communicator*^{TM} and *Microsoft Internet Explorer*^{TM}

- When preparing information for WWW publication designers must consider such issues as: differing machine and monitor capabilities, visual fatigue, user defined interface, and cross-platform colour consistency.

- HTML does not allow the same level of flexibility as current desktop publishing software packages in layout and design.

- WWW publication has advantages over traditional forms of publications in speed, and cost. It also allows for the possibility of increased currency through the constant updating of content.

- Web based hypermedia offers some advantages and some disadvantages over CD-ROM based hypermedia products. Advantages include the potential for constant currency of publication, global access to the information, potential for interaction and communication with the audience of the information. Disadvantages include: Inflexibility in presentation style, and a limited ability to included memory intensive technologies such as video.

Chapter 3

3.0 Sustainable Community Design:

3.01 Introduction:

Sustainable Community Design is a layered term. It involves two complex concepts, sustainable development and community design, which are combined to describe a more complex concept relating to settlement practices.

In theory, sustainable community design is a layering of concepts and in practice a synthesis of disciplines. A sustainable community is realized through the combined efforts of many disciplines, whose contributions must be layered onto each other to achieve the goal of a sustainable community.

None of the traditional design disciplines (landscape architecture, architecture, city planning, engineering) can be said to be the key player in the design of a sustainable community. A true sustainable community requires all of their inputs, including members of the community at large, to be successful.

The complex nature of Sustainable Community Design is illustrated by the following quotes from designers and practitioners of sustainable technologies and communities about their work.

The blending of architecture, solar, wind, biological and electronic technologies with housing, food production, and waste utilization

within an ecological and cultural context will be the basis of creating a new design science for the post-petroleum era."[32]

What we term "sustainability" was a reality inherent in many pre-industrial cultures. It was usually built into their beliefs, their practices, and the design of their environment.[33]

The sum of these trends will set a new direction for urban design: more compact, mixed use communities, more efficient buildings, diverse transit systems, an ecologically sound agriculture, water and waste conservation, and ultimately, a greater sensitivity to the uniqueness and integrity of each region.[34]

This work is an attempt to show that community design must be multi-disciplinary and that combining problems often leads to simple solutions while segregating problems typically leads to frustrations.[35]

In my work there is no possibility of being a specialist. Every project has a political, economic, ecological, social, technical, aesthetic, and ideological dimension.[36]

"A sustainable community is one whose energy economy does not use more energy in a given time than falls on its hinterlands as sunlight in that time, and in which the material economy is circular rather than linear."[37]

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[32] Nancy Jack Todd, John Todd, *From Eco-Cities to Living Machines: Principles of Ecological Design* North Atlantic Books, Berkeley Ca. 1994 p. 12

[33] Sym van Der Ryn and Peter Calthorpe *Sustainable Communities: A new design synthesis for cities, suburbs and towns.* Sierra Club Books: San Francisco CA. 1986. p. iv

[34] Sym van Der Ryn and Peter Calthorpe *Sustainable Communities: A new design synthesis for cities, suburbs and towns.* Sierra Club Books: San Francisco CA. 1986. p. ix

[35] Peter Calthorpe, *The Next American Metropolis: Ecology, Community and the American Dream.* Princeton Architectural Press New York NY. 1993. p. 10

[36] Peter Calthorpe, *The Next American Metropolis: Ecology, Community and the American Dream.* Princeton Architectural Press New York NY. 1993. p. 10

[37] Richard Risemberg. "A Paradigm for Sustainability", Geocities Web Site *http://www.ficus.usf.edu/exhibits/sustain_exhibit/default.htm* Aug 13, 1998

Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.[38]

Using key words, phrases, and ideas in these quotes the following definition helps to illustrate the complexity and challenges of undertaking sustainable community design.

Sustainable community design is concerned with housing, food production, water, waste and energy utilization and management, transportation, and local and global economic realities. SCD reflects a multi-disciplinary ecological, cultural, spiritual, economic, aesthetic, political, and ideological framework that is indigenous to a specific region. It offers simple solutions to the complex concept of community design which meet the needs of today, without compromising the ability of future generations to meet their own needs.

Each of the concepts in this definition evokes its own issues and in some cases visual imagery. However, the definition in its entirety does not evoke a clear picture of how sustainable community design could manifest itself in physical and ideological implementation. This illustrates the need for a strategy to help communicate these concepts not only in textual form but also in a visual form. Just as SCD is a complex issue, its illustration should take on a complex form in order to arrive at a simple and understandable explanation. An

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[38] Brundtland, *Our Common Future: The world commission on Environment and Development* Oxford University Press, New York, NY. 1987 p.8

effective way to approach the illustration of an information set such as SCD is with several tools of explanation which can be used in combination to best explain each facet.

Imagery has been an important component of many investigations of SCD in traditional print media. Many works on SCD include a large amount of graphic information. This information includes bubble and conceptual diagrams, community plans and zoning information, perspective drawings of proposed communities, and photographs of existing communities. The SCD web site takes this further. The site not only includes significant imagery, but it also attempts to describe each issue in a visual as well as textual form.

In their work *Assessment of Built Projects for Sustainable Communities*[39] Perks and Van Vliet identified 9 separate categories of information that helped describe the concept of a sustainable community. They then further divided those nine categories into 150+ design features. The presence or absence of these features was then used to assess the level of sustainability of a series of case study communities in northern Europe. The information structure that they developed provides one example of the layering of information that is inherent in any attempt to describe a concept such as Sustainable Community Design.

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[39] Perks, W. T. and D. Van Vliet. 1993 *Assessment of Built Projects for Sustainable Communities.* Canada Mortgage and Housing, External Research Program, Ottawa. Draft

An example of the layers of information, extrapolated from the work done by Perks and Van Vliet[40], that go into making up Sustainable Communities are:

Layer One: The concept of *sustainable community design.*

This concept is broken down into 9 categories which make up the whole:
- Building Ecology
- Land Use / Landscape Ecology
- Community Design
- Energy
- Transportation
- Water and Sewage
- Waste and Recycling
- Community Management
- Economic Viability

Layer Two: One of the nine categories. Water *and Sewage* for example.

Each category on layer two is further divided. Water and Sewage is divided into 2 sub-categories:
- Home water management
- Community water management.

Layer Three: One of the sub-categories. *Home Water Management* for example.

Each sub-category is divided into issues. Home water management is divided into 4 issues:
- Grey water circuit and use
- Water saving appliances
- Waterless toilet
- Rain collection and use.

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[40]Perks, W. T. and D. Van Vliet. 1993 *Assessment of Built Projects for Sustainable Communities.* Canada Mortgage and Housing, External Research Program, Ottawa. Draft

Layer Four: One of the issues identified in a sub-category. Grey *Water Circuit and Use*. for example.

While the concept of SCD is made up of a complex series of layers, the information within those layers is not discrete, but equally or even more complex than the exo-structure of Sustainable Community Design itself. The information illustrated in the fourth layer is in many cases interrelated with many other information sets within the whole of SCD thus forming the fifth information layer, which is inherently the most complex.

Layer Five: Layer five describes *the interrelationship between related issues* of SCD, by doing so, it illustrates the complexity of the structure necessary to support a sustainable community.

In traditional print media layer 5 manifests itself in the format of footnotes and endnotes which point the reader in the direction of related resources. Within the SCD web site layer five is manifested in the hypermedia links which join each design feature to the next. This layer is created by linking the information about grey water recycling with other related subjects such as economic viability of grey water recycling, community water infrastructure, community waste water management, and constructed wetlands for example.

Figure 7 on the following page is a graphic representation of layers one through five as they appear on the Sustainable Community Design web site.
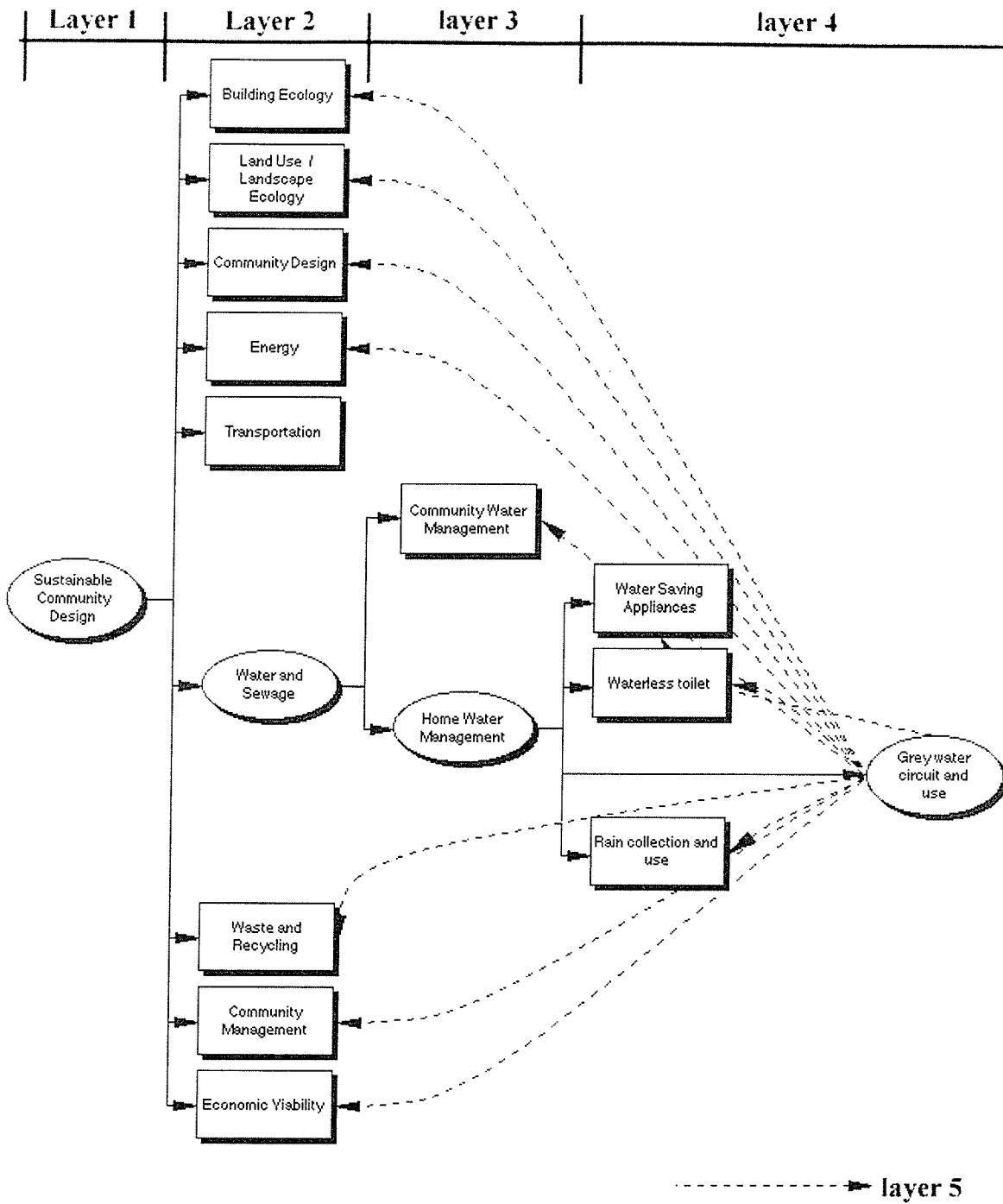
Figure 7. Information layers on the Sustainable Community Design Web Site. Layer 5 is represented by the dashed lines on the diagram.

Sustainable community design, like other types of sustainable development, takes factors into account other than those considered by traditional design and development practices. Resource management is one area in community design where this difference is apparent.

Traditional resource management practices with regard to communities have historically been linear in nature. A resource enters the community, is used and converted into a waste product, and is then disposed of. In this model, there is a constant net gain of resources and a constant net loss as well. Resources constantly flow in and out of the community. One goal of sustainable community design is to reduce or eliminate the linear nature of typical resource management and convert it into a more closed or self-supporting system.

In this type of system, resources enter the community at a reduced rate and are used and re-used before they are allowed to exit via a reduced waste stream. This is done, while at the same time linking the individual community to larger civic, regional, or even global systems, recognizing that not all systems can be closed loops on the small geographic scale of a single neighbourhood or community. This approach is generally described as an ecosystem approach.

The ecosystem approach views the community as a single ecosystem with a series of related and intertwined energy, material and cultural streams. The upstream and downstream effects of which must be

taken into consideration during the design and planning process. This approach entails idea that an ecosystem is a closed loop system in which everything is dependent on everything else for its survival. The waste of one organism becomes the food of another. resulting in little net loss or gain of resources over time.

An example of the complex structure that is inherent in the resource management of a sustainable community is that of the sustainable approach to grey water recycling in the home. In a traditional home, based on a traditional linear approach to resource management, water arrives via a water main. It is used in washing, bathing, cooking, or toilet flushing and then leaves via the home's sanitary sewer. Some water used in garden irrigation may leave through a storm sewer that collects water that runs-off from the garden during a rain storm, or due to over-irrigation.

In using a more sustainable approach water may still come to the home via the water main, but a portion may also come from rainfall or other sources. Some still may be used only once for toilet flushing, and then be sent directly to the sanitary sewer. However, water used for bathing, clothes or dish washing, or cooking is filtered and re-used for toilet flushing, or garden irrigation. By utilizing water more than once, the sustainable system reduces the demand for fresh water in the home. This reduces the amount of water sent to the sanitary sewer. This has several effects:

- reduced use of potable water in the home
- reduced demand on local infrastructure effectively increasing capacity of existing systems for the delivery of fresh water and the removal of waste water
- reduced waste water in municipal treatment systems effectively increasing the capacity of those systems and reducing their per dwelling cost.
- reduced waste water, treated or otherwise, entering local water systems (rivers and lakes).

The garden in a more sustainable home would also be designed to catch water, rather than to shed it like a typical suburban landscape. This would decrease the amount of water necessary for irrigation and increase the amount of water that is returned to the ground water table through infiltrations. This would help decrease the necessary size of storm sewers in the area and reduce another type of waste flow out of the community.
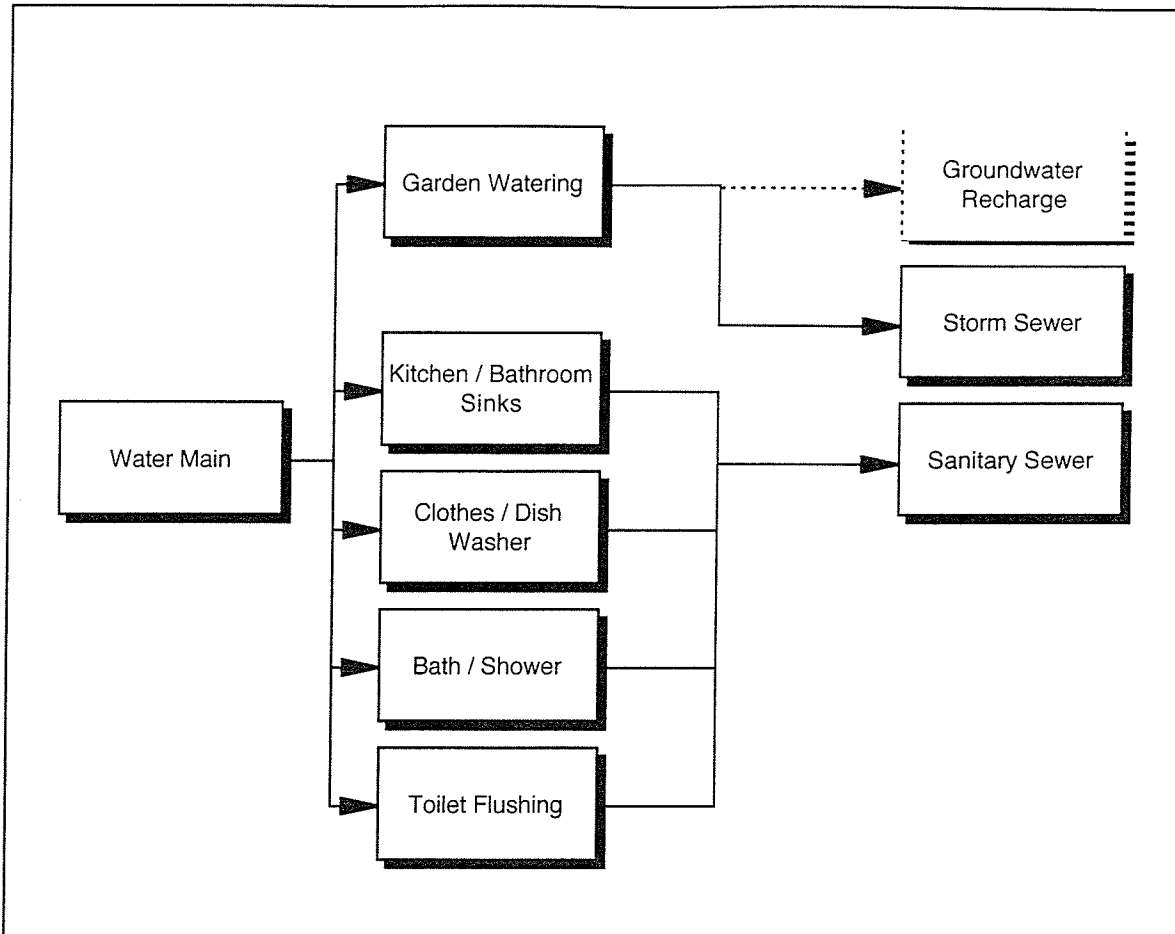
Figure 8   Flow chart illustrating traditional water management in the home.

The traditional home has a very simple linear system with one source and one main output, and all water is used only once within the home and then disposed of (figure 8.).   The more sustainable system employs more than one water source, and includes loops within the system to store and re-use water more than once.   It then employs more than one mechanism to dispose of the water (figure 9.).   In illustration the traditional use of water in the home appears as a straight line from upstream to the home to downstream.   In an illustration of a more sustainable system the line branches and loops.
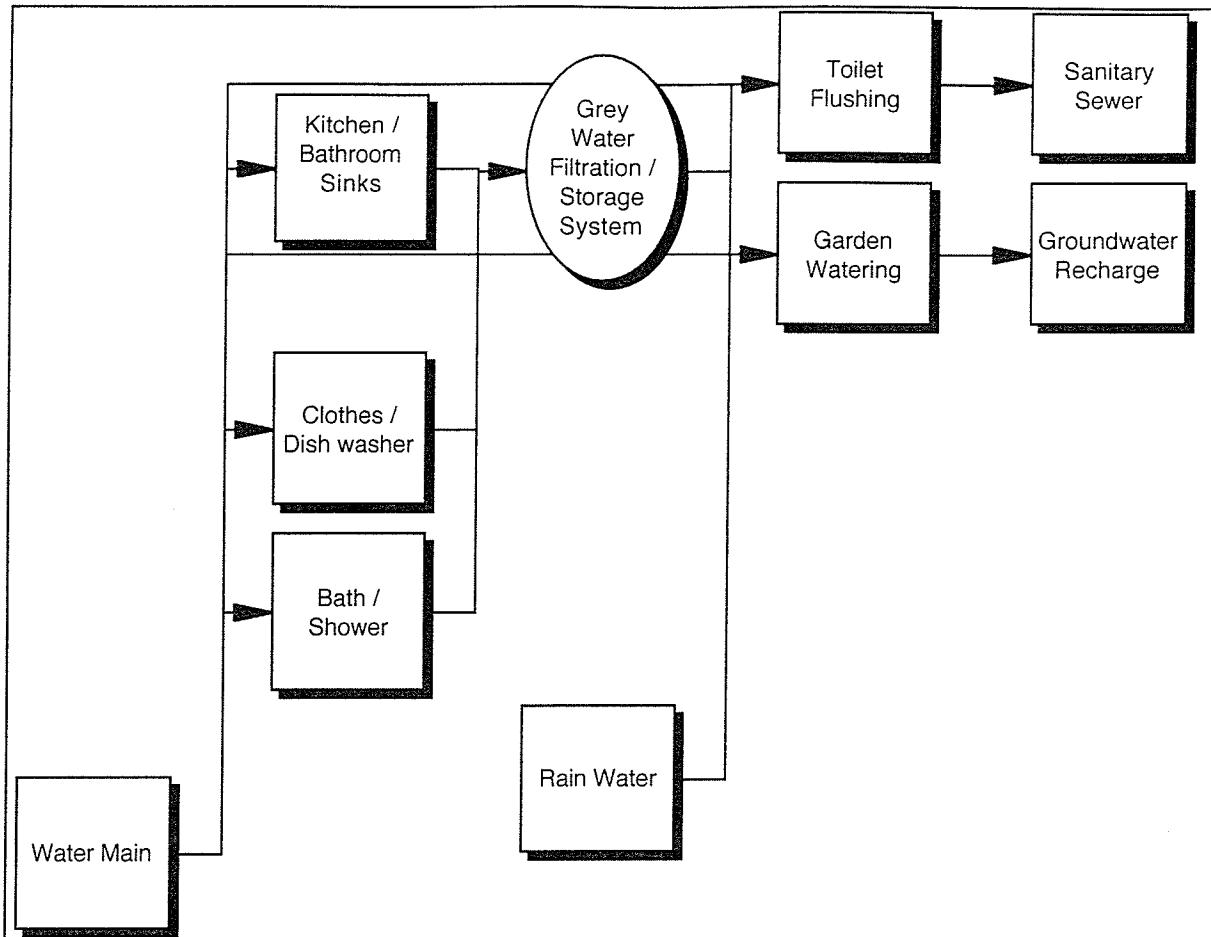
Figure 9.   Flow chart illustrating water management   in the home with increased   sustainability.

The sustainable home has both positive upstream and downstream effects.   Upstream effects include less demand on municipal or ground water resources, which could lead to a reduction in the size or need of infrastructure.   Downstream effects can include a more stable ground water table and less water in the sanitary sewers, which results in less need for infrastructure (water mains, and water cleaning plants).

The designer of the sustainable home must incorporate a more complex water management system than is present in a traditional

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home. The architect of the sustainable home must be in contact with not just the traditional building trades people, but also with the landscape architect and the community designer to properly plan the sustainable water system. The increased level of complexity inherent in designs which take the sustainable approach requires coordination and communication between designers, building professionals, planners and policy makers. This is due to the fact that both a traditional home in a traditional community, and a sustainable home in a sustainable community, have far reaching effects on local infrastructure and environments. Planning for and communicating these effects, their impacts on other systems, and features of the sustainable home or sustainable community is another very complex problem.

Of the 150 issues identified by Perks and van Vliet in 1993, less than 10 relate directly to home water systems. If these are not addressed in the design of a community, effects would be felt beyond these 10 issues. Each of the 150 issues form part of an interdependent web. It is difficult to effectively communicate any single issue in isolation because each one is inevitably linked to, and dependent on other issues.

Figure 10 illustrates this interdependent web of direct and indirect relationships that exists between Perks and van Vliet's 150 issues. In this theoretical portrayal the central figure represents an individual issue. The solid lines indicate direct relationships to other issues. Dashed lines indicate indirect relationships.
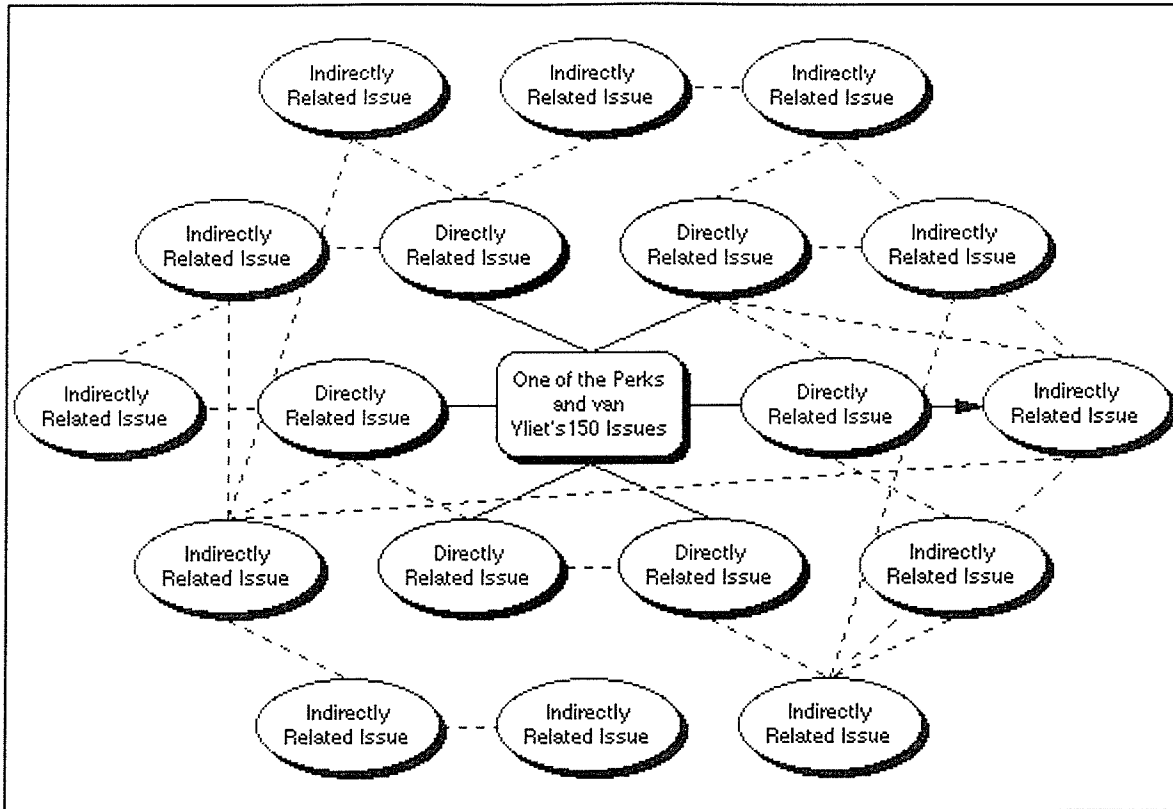
Figure 10. A graphic illustration of the interdependant web formed by Perks and Van Vliet's 150 issues for sustainable community design. Solid lines indicate direct relationships to the main issue. Dashed lines indicate indirect relationships.

Hypertext can be particularly useful in describing this series of complex relationships. "Hypertext denotes text (information sets) composed of blocks of text... and the electronic links that join them."[41] As noted previously, hypertext has a navigation function as well as a traditional literary function. This navigation function allows the designer to link information together in a non-linear fashion and allows the reader to determine the narrative flow of the piece. Hypertext linking provides the creator / educator / designer

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[41] George P. Landow *Hypertext: The convergence of contemporary critical theory and technology.* The Johns Hopkins university Press Baltimore MA 1992. p. 4

with a powerful tool for developing / illustrating relationships between discrete pieces of information.

Through careful linking and cross-linking it can be made apparent to the user that "different" subjects that link to the same file or files must be related to, or may be dependent on each other. It can function as strings that link each issue to multiple others. The linked issues can then be understood as a single concept, sustainable community design. This tool becomes especially effective when the information being communicated is complicated and multifaceted, such as with sustainable community design.

In the case of the layering mentioned previously, the user may chose to read all of the information provided on each layer, before proceeding to the next layer. However, by employing hypertext the designer can give the user the choice to use hyperlinks to other parts of the document following the information that he/she is after in the order that they want it and not necessarily the order that is presented by the author of the document.

Figure 11 shows how the designer can offer linear and non-linear navigation opportunities to the user by employing hypertext. The solid lines represents linear navigation. Dashed lines represent non-linear linking opportunities to related issues provided by hyperlinks.
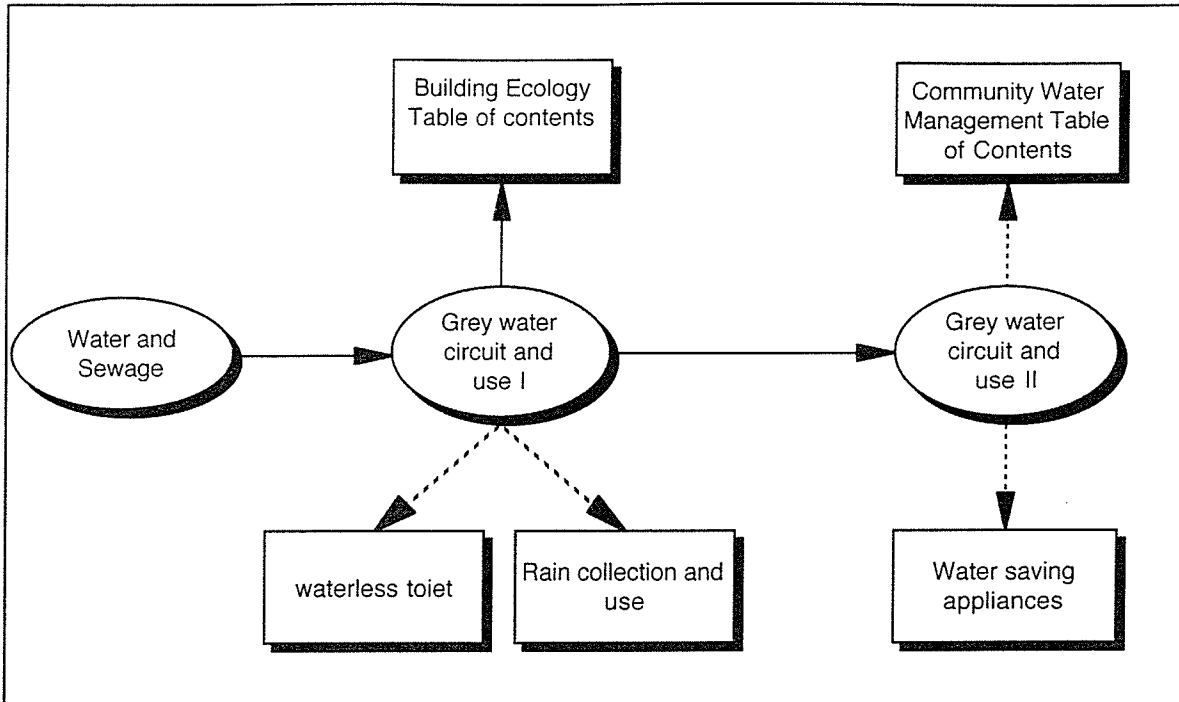
Figure 11. An graphic illustration of how hypertext can offer non-linear and linear navigation opportunities. Solid lines represent linear navigation. Dashed lines represent non-linear navigation opportunities provided by hyperlinks.

By linking information the designer provides opportunities for the user to discover relationships between bits of information and create mental links and bridges between those information sets.

3.1 Summary:

Hypertext is an effective tool to use for the illustration of Sustainable Community Design for the following reasons:

- SCD is a complex, layered issue and hypertext allows easy linking between multiple layers through common references.

- each individual issue is interrelated to others and therefore already forms a web of information providing ready opportunities for hypertext linking

- many of the issues are very visual, and hypermedia and the world wide web provide ample opportunity for exploration of the issues in a visual manner

Chapter 4

4.0 Case Study: The Sustainable Community Design Web Site

4.01 Introduction:

The Sustainable Community Design web site is located on the WWW

at: *http://www.cadlab.umanitoba.ca/la_www/sustainable/index.htm*

The site is comprised of two major sections; the Case Studies Section and the Design Features section. The two sections are comprised of approximately 600 individual HTML files and a corresponding number of images. The Case Studies section includes descriptions and illustrations of existing sustainable communities, or communities that include sustainable features. The Design Features section includes definitions and illustrations of Perks and van Vliet's 150 issues of Sustainable Community Design.

Designers have traditionally presented ideas in plan/section form to clients. On larger jobs, one or two perspective drawings are usually created of critical spaces in the design. Perspective drawings however, do not reflect how the general public encounters the world, or how they will perceive the design when it is completed. The entire design, from the landscape to the washrooms, will be encountered from multiple angles, distances, times of day and season, and in varying levels of detail. Most people perceive the world in 3-dimensional, real-time, full colour. To effectively communicate sustainable community design, designers need to focus on this model and not the tradition design approach of blueprinted plan and section, or the traditional approach of the researcher, which

is a text based approach. E. Flaherty, in an e-mail message to the LARCH-L listserver states: "it is my conclusion that the plan, section, elevation and perspective methodology for communicating our design[s] is at the heart of this perennial communication problem"[42]. Clients often do not have the skills to interpret a plan, section drawing, or a text only description. However, most people do have the ability to look at a photograph or watch a video and interpret the images in 3 dimensions. Whether they can then understand the significance of those images, is the task of the visualization.

People's understanding of the structure and character of their neighbourhoods and communities is predominantly a visual understanding, which is described in terms of its physical elements. In order to effectively propose or argue for a new paradigm, which is one of the aims of the SCD web site, one needs to present an equally compelling visual argument for the alternative.

Visualization refers to the explanation of a concept making use of visual material as a primary means of communication.[43] It is this task, visualization, that the Sustainable Community Design web site was developed to address. In order to achieve the goal of visualizing SCD, the authors first had to identify a target audience for the information. The target audience for the information includes developers, designers, policy makers, the home buying public, as well as researchers and students who are interested in the issues

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[42]Edward Flaherty, e-mail posting to the L-ArchL Listserver, July 10, 1998
[43]*Visualization techniques,*
http://bamboo.mluri.sari.ac.uk/`jo/litrev/chap3.html, 08/10/97

surrounding SCD. Next, a medium capable of delivering a large amount of textual information and multiple types of visual information had to be chosen.

The authors had to chose from two digital mediums; WWW based hypermedia and CD-ROM based hypermedia. CD-ROM based hypermedia had some advantages over the web. The data transfer speed from a CD-ROM was much faster than that available over the web. This translated into faster access to information. It also enabled the technology to present information in memory intensive ways, such as video, without causing the user to have to wait to access the information. CD-ROM based hypermedia also allowed greater flexibility in information design and layout. *Macromedia Director*TM, the software that would be used to program the CD-ROM, did not have the same restrictions in terms of font size and type or screen layout that were present in web based hypermedia. However, web based hypermedia while not as flexible a presentation medium as CD-ROM based, did offer certain advantages.

By basing the information on the WWW, no distribution network had to be developed. Unique features of the WWW such as chat rooms and forums provided opportunities for users to interact with each other and with the authors of the information. By publishing the information via the WWW it could be accessed for "free" by users. In contrast, CD-ROM publication would have involved printing and distributing the CD-ROM, the cost of which would have been passed on to the user.

The decision to use the WWW as the delivery mechanism for the information was made for the following reasons:

- the WWW is a digital medium which provides opportunities for enhanced visual communication techniques (multi-media)
- hypertext provides opportunities to enhance visualization and comprehension of a complex concept.
- the WWW is an increasingly accessible medium
- the WWW provides for almost instant distribution as well as the possibility for equally instant feedback from the audience.
- the WWW is an inexpensive method of publishing, especially considering the volume of graphic information (in colour) the authors wished to include.

With the audience and the delivery mechanism identified, the authors then had to develop a structure for the site that would best communicate the information. The authors chose to base the organizational structure of the site on the nine broad categories outlined by Perks and van Vliet in *Assessment of Built Projects for Sustainable Communities*. The 150 issues identified under the nine category headings formed the sub-structure. The site is further divided into two major sections; Case Studies and Design Features. The Case Studies section includes seven case studies of existing sustainable communities. These cases are also structured according to the nine categories / 150 issues outlined by Perks and van Vliet. The Design Features section is an exploration of the 150 issues in which each is defined and illustrated (See Appendix C).

The next task was to develop a transparent navigational structure for the large volume of information that would be contained within the

SCD web site. The structure had to be simple enough that the programmer of the web site could effectively manage all of the HTML files, and their corresponding hyperlinks. It also had to enable a visitor to the site to easily navigate the information without getting lost or frustrated. It was also necessary to find a graphic interface that would facilitate navigation.

A search was undertaken to determine if other sustainable community design web sites employed a consistent format for SCD information on the WWW that the new site could duplicate. The authors used the Altavista search engine (*http://www.altavista.digital.com/*) which is arguably the most powerful web search engine currently available[44]. Approximately 100 matches for the term "sustainable community design" were found. Of these matches, only 5 sites actually made use of the term "sustainable community design". The other 95 matches were either additional files in the same 5 web sites, or they made use of the terms sustainable, community, and design within their documents, in that order, but not as a single term. For example, one of the sites found used the word "sustainable" in the document's title, the word "community" in the first paragraph and the word "design" in the third paragraph.

Of the five sites that made use of the term "sustainable community design", three contained no content regarding the practice, purpose

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[44]The Education Computer Lab
http://www.umanitoba.ca/edlab/search.html

or potential of sustainable community design.. The first of these was a course outline from Huxley College[45]. Second was a professional biography of Margarita Hill of the University of Maryland' faculty of Landscape Architecture[46]. The third was an advertisement for a design firm[47].

The other two web sites found, offered some information about sustainable community design. The first of these sites, *FICUS, The Florida Internet Center for Understanding Sustainability*[48] was quite large. However, there was only one file relating specifically to SCD on the site. The file was entitled *Sustainable Community Design Principles*, and was derived from a study called *Transportation, Landuse and Sustainability,*[49] focusing mainly on transportation issues. It only included a few hard to read line drawings, several of which had to be scrolled through because they were too big to fit on the screen, and no photographs. The other site, *Guidelines and Principles for Sustainable Community Design,*[50] was a masters thesis written by Robert Hsin from Florida A&M University. While being an interesting and useful document, it contained no graphic material at all. Its structure was linear in nature and therefore, not a useful

[45]*Huxley College COURSES IN ENVIRONMENTAL STUDIES*
http://www.wwu.edu/CampusInfo/AdmRegInfo/Catalog_95/Huxley/EnvStud.html   15/08/98
[46]*Margarita Hill Assistant ProfessorHorticulture & Landscape Architecture*
http://www.agnr.umd.edu/users/larc/hill.htm   15/08/98
[47]*Sustainable Design Group*
http://www.sustainabledesign.com/sdg-svcs.htm   15/08/98
[48]FICUS: The Florida Internet Center for Understanding Sustainability
http://www.ficus.usf.edu/
[49]Transportation, Landuse and Sustainability,
http://www.ficus.usf.edu/library/default.htm   1994.
[50]Guidelines and Principles for Sustainable Community Design
http://fcn.state.fl.us/fdi/e-design/online/9607/thesis/thesis.htm,   1996.

example on which to base the SCD web site. Neither site had a particularly simple or attractive graphic format, or a transparent file structure. Additionally, there was no hypertextual integration of the information within either of these documents thereby failing to take advantage of the capacity of the web to communicate complex ,interconnected concepts by employing it.

The results of this web search indicated that there was very limited sustainable community design information on the WWW. There was no example of a layout that was appropriate to duplicate on the SCD web site. The search was then expanded to examine related web sites addressing issues such as sustainable development, design, communities, technologies and co-housing, to determine if a suitable format existed elsewhere.

Of the many sites examined in that search, a list of which appears in Appendix B., none was fully appropriate. Most sites could be categorized in one of the following ways.

Commercial Sites:
Commercial sites were those advertising technologies, communities or processes in order to find new members or clients. The content of these sites focused on the merits of an individual project. The sites were not intended to educate users about larger concepts.

A number of co-housing community web sites fell into this category. Most of these sites followed a similar format. They included a brief

description of the project and an outline of its outstanding or unique features. One or two images were presented, including photographs if the project was complete. Pricing and contact information, and a series of links to other such projects or related web pages, completed these sites.

All of the commercial sites tended to be quite small, usually 1-3 HTML files in size. The HTML files included long passages of textual information generally with a single graphic at the top and or bottom of the page.

Government Sites:

The Government Sites examined or listed publicly funded projects, generally focusing on the broader concept of sustainable development. These included energy conservation initiatives, community design, and social infrastructure projects. The government sites were generally large and difficult to navigate. The smaller sections of the sites presented case studies, or links to case study sites. The case studies, if they were contained within the government site, were consistently formatted. However, they rarely included links between cases, although issues overlapped. Government sites in general did not include photographic or other graphic imagery.

Archival Sites:

The Archival Sites catalogued and provided links to other sites. In some cases the authors of the archival sites annotated and rated the

sites indicating the content of each site and its strengths or weaknesses. Archival sites generally didn't contain content information other than site annotations, and rarely included graphics.

Image archives.

There was only one image archive site located in the search. It contained several thousand images of sustainable energy related technologies. Unfortunately the site included no textual information to accompany the images to help with interpretation.

After completing this web search, the authors of the SCD web site came to the conclusion that none of the formats reviewed were appropriate for the proposed site. The graphic layout and file structure that was chosen for the SCD web site was based more on the format of CD-ROM based multimedia encyclopedias, than it was on examples seen on the WWW.

This layout employs a rigidly consistent font size and type, colour scheme, layout and file size. This strategy is not consistently employed on other web sites, but is identified as an important factor in the literature of computer aided and computer based instruction. Criswell[51], Price[52], and Soulier[53], all suggest that simplicity and

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[51] Criswell, E. L., *The Design of Computer Based Instruction* Macmillan Publishing Company, New York. 1989 p.89
[52] Price, R. V. *Computer-Aided Instruction, A Guide For Authors* Brooks/Cole Publishing Company, Pacific Grove, California, 1991. p.136
[53] Soulier, J. S. *The Design and Development of Computer Based Instruction*, Allyn and Bacon Inc. Toronto Ont. 1988. p. 175

consistency in screen layout in computer based instructional material enhances learning performance.

The format for the web pages, which closely follows examples outlined by Criswell[54] and Galitz[55], is a simple and consistent invisible 5 cell table following the form indicated in the figure 12..

top left section title and web site logo	top right page number
centre left textual content for the page	centre right image content for the page
Bottom site navigation buttons, section navigation buttons (forward / back)	

Figure 12.   An example of the information structure of each page on the SCD web site.

This format, applied to the information given resulted in the graphic display in figure 13.

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[54]Criswell, E. L., *The Design of Computer Based Instruction* Macmillan Publishing Company, New York.   1989 p. 85

[55]Galitz, W. O. *Handbook of Screen Format Design.*   Wellesley, MA: QED Information Series   1981. p. 42

Land Use/Landscape Ecology

$2/4$

Neighbourhood Gardens:

Planning for successful community gardens will consider issues of user type, location, size, garden type, ownership and maintenance.

User Type
A user's interest depends upon factors such as age, occupation and lifestyle. Due to a wide range of users, the garden, or gardens must accommodate a variety of needs:

- Families require "tough" gardens to withstand playing children. The gardens are often adjacent to open spaces for play.
- Elderly or disabled people usually require raised beds which reduces the amount of work at ground level, use of pots for plants and often require community help for maintenance.
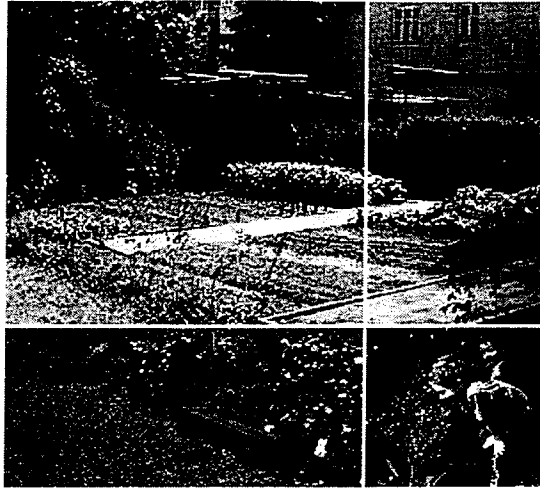
home   cases   features   contents   examples   ◀   ▶

Figure 13. An example of the standard appearance of one page of the SCD web site

Bold titles at the top left of the screen indicate to the user what section of the site they are in currently. Below the section title is the page title. This indicates the specific subject of the textual and visual material of that file / page. Below the page title is the textual content for the file. At the bottom of the page are the global navigational buttons. On the top right of the window is the page numbering for the current section. In figure 13. the graphic 2/4 indicates that the user is currently examining page 2 of 4 in the file series. Below that is the graphic content of the page. At the bottom are the sectional navigation buttons.

The navigational structure of the web site has been designed as a series of interconnected loops of varying dimensions. These loops

are largest at the SCD web site's main table of contents and get smaller as the user navigates into the site to the detailed sections and sub-sections.

For example, the Case Studies section of the web site includes approximately 200 individual HTML files (this does not include footnotes or table of contents pages). If the user goes one level down to a specific case study there is approximately 30 files in each case. One level further down, in one category section of a specific case there are approximately 3 files. The navigation buttons are programmed in a loop fashion where the first and last files in a series are connected to the table of contents one level up and the intervening files are connected to each other. These loops minimize dead ends in the file structure.

The information loops are connected (linked to other loops) and interconnected (linked within their loop) through the use of hypermedia. On each page of the web site there are a minimum of 3 hypermedia links and an average of 8 or 9 (See figure 14). This excludes pages listing image / photo credits, which have only one. These links allow the user to jump to related loops.

Section Title

Page Title

Hyperlinks to
other sections
of the web site

Page Number

Forward /
Backward
in this
section

Link to the
Home Page
of the
SCD web site

Link to the
Index of the
Design Features
Section

Link to the
other pages
with
related examples

Link to the
Index of the
Case Studies
Section

Link to the
Table of Contents
of the Slagelse
Case Study
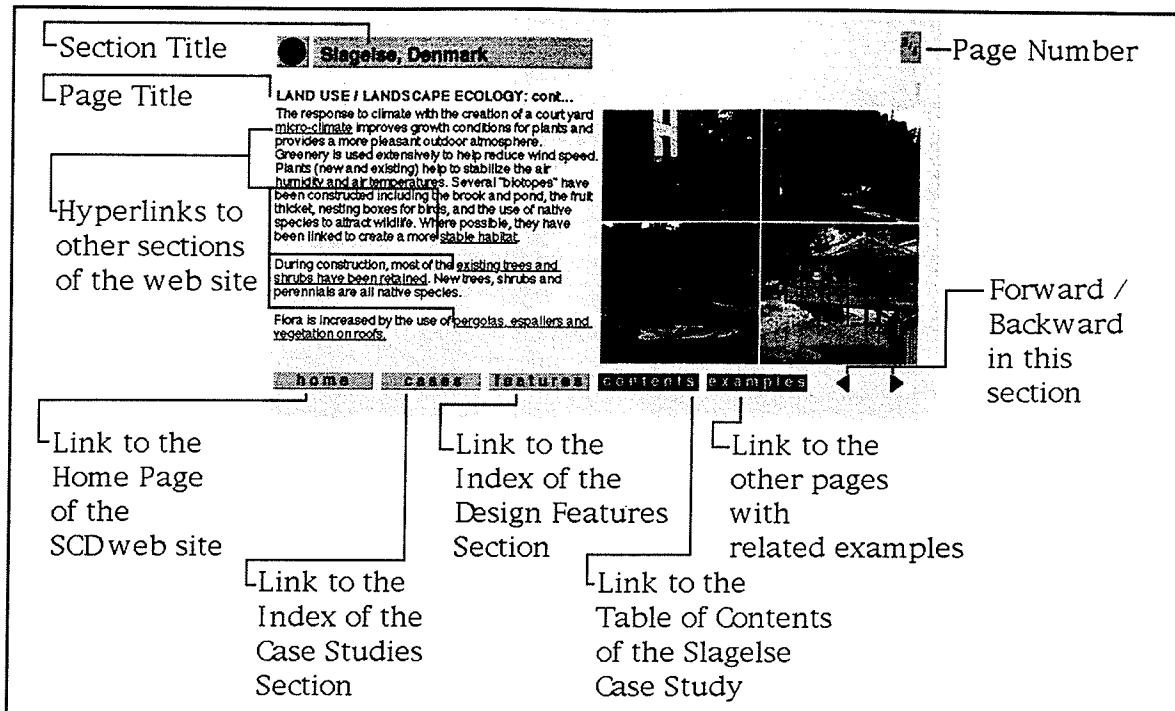
Figure 14. An illustration of the hyperlinks present on one page of the SCD web site.

Each page of the web site includes a series of standard links to allow the user to jump from one information loop to the beginning of a larger loop. These standard links are:

- the **Home** button which takes the user back to the table of contents for the entire site
- the **Cases** button which takes the user to the page listing all of the Case Studies documented on the site
- the **Features** button which takes the user to the design features index page,
- the **Contents** button which takes the user to the table of contents for the section that the information section they are currently viewing,
- the **Examples** button which will take the user to a page with a series of hyperlinks to related examples within the web site, in both the cases studies section and the Design Features section.

The main image on each page of the web site also has a hypermedia function. When activated it takes the user to a file that contains the credit or reference information for that image. Each file on the SCD web site also includes a backwards and forwards button for navigation within the current information loop.

By providing multiple hypermedia links from each HTML file to several others, the SCD site creates an internal web. This web acts to bind the information together, not only in the sense that files become linked, but it also begins to bind the entire information set together. This helps the user take the mental leap from viewing individual or discrete entities to that of viewing pieces or cells of a whole information system.

4.1 Hardware Issues:

The web site was designed to stay within the limits of the 640x480 pixel resolution so that it would be legible on the largest number of machines possible. This decision reflects that governments, schools, universities, the general public, community developers, and designers (the target audience for the piece) do not always have access to the newest technology. This is often a problem with the web. Programmers develop sites to the maximum potential of their own personal machines which generally have greater capabilities than those of their intended audience.

One of the drawbacks, or limitations of the digital presentation of information is insufficient monitor resolution. "Much less

information is presented on a computer frame than is presented on a page of printed text. In addition, the resolution is poorer on a computer screen than it is on a printed page."[56] Using a screen set to just 640 x 480 resolution, each page of the web site can contain only 100 - 150 words of text. This fills approximately 1/3 of the entire viewing area of the browser window. In contrast, 1/3 of a standard printed page of text is approximately 250 - 300 words. To fit more text on each page the font size would have to be reduced from 12 point to 10 or 9 point. The result of this would be an increased amount of text on each page, but a decrease in the legibility of the text. This in turn, would decrease the time an average user could comfortably spend reading the material off the screen before visual fatigue became a factor.

The 100-150 words on each page of the SCD web site, usually represent 2-3 short paragraphs that are designed to convey one or more discreet idea. On the site, individual concepts or ideas do not run from page to page, but are communicated completely on just one page. This allows clear communication of ideas, without the interference of technology. The purpose of this was to allow users to read and evaluate each concept in its entirety without having to navigate between pages. It also allows users to completely learn a concept, before using one of the 8 or 9 non-linear navigational opportunities present on the page. Thus enabling them to combine complete concepts with concepts from other loops in the document.

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[56]Criswell, E. L., *The Design of Computer Based Instruction* Macmillan Publishing Company, New York. 1989 p.91

This format forced the authors to be very clear, concise and economical in their explanations and descriptions..

4.11 Visual Fatigue:

Several design decisions were made in an attempt to reduce the impact of visual fatigue on the users during the development of the SCD web site. The web site makes use of the font Helvetica 12 on a *Macintosh*™ computer and Arial 10 an a P.C.. Each is a large san serif font. The relatively large font sizes were chosen due to the low resolution of a standard computer screen. They are a compromise between legibility, and fitting the maximum amount of textual information on each page.

The colours that were chosen for the web site were black text and a soft yellow background. The yellow colour is light enough to provide strong contrast with the black text, while not being as bright as a white background. This helps to reduce glare off of the monitor, which can be a major factor contributing to the onset of visual fatigue.

4.12 Scrolling:

Scrolling was an important issue in the development of the web site mainly because of the site's graphic nature. Nowhere on the SCD web site does the user have to scroll down the page to find the end of the description of the image, and then scroll back up to view the image. The text and the image become one presentation, each one half of the whole, each with a similar visual weight. By designing the web site

so that no scrolling would be necessary, the authors made it possible for each whole statement (both visual and textual) to be made without the user employing any technology which may distract their learning process. In the case of the web site it is especially important, because as an educational resource, the authors wanted to use technology to enhance, not impede the learning process. This is a good example of a decision that was influenced more by the format of a multimedia encyclopedia than a traditional web site.

4.2 Software:

4.21 User Defined Interface:

The SCD web site attempts to circumvent the issue of a user defined client software interface by employing a rigid consistency of format from file to file, as well as providing detailed instructions on how to set up a browser to best view the web site. This control allows the user to define the best "fit" for themselves and the information, while encouraging the use of the parameters set out in the initial design of the site. The layout of each individual file in the web site purposefully ignores the capabilities of the user to change the format of their client software beyond how the authors would like to see it formatted. This was done for two reasons. First, it would not be possible to design a web site that was optimized for every client software configuration. Second, the web site was designed for a standard 14"-15" monitor with 640 x 480 pixel resolution. At this screen resolution each page has been designed to fit the maximum amount of information possible without the scroll bars becoming present.

4.22 Network / Modem Speed:

The web site violates the 35k rule of thumb[57], as outlined in Chapter 2, on virtually every page. However, it is designed so that each page of the web site is as small as possible to facilitate speedy downloads. One of the rationales for violating this guideline is that the web site will be available remotely via the internet, but it will also be available on CD-ROM. File transfer speeds from a CD-ROM will be much faster (at least an order of magnitude) than remotely accessing the files over the web. Also, many of the projected user groups for the SCD web site have access, through universities, schools, libraries, and government networks to a fast internet connection, such as an ISDN line or a T1-T3 connection. Users with this kind of connection will not have trouble accessing the SCD site via the web. Those without high speed access will have the opportunity to order a CD-ROM of the site. In the end speed of access had to be sacrificed over quality of content. Without large graphic images, the purpose of the site, the visualization of sustainable community design could not have been achieved.

4.23 Graphics Formatting:

Just as the overall graphic format of the web site employs a rigid consistency, the graphical information within each page of the web site does as well. The images on the web site are all the same size, 300x270 pixels. Each image is generally subdivided in one of five ways which are illustrated below in figure 15..

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[57]Personal Communication: Helen Bochonko, 1996

- one 300 x 270 pixel image (or multiple images in the case of an animated GIF, or QuickTime VR file)
- 2 images in a vertical relationship
- 2 images in a horizontal relationship
- four 149 x 134 pixel images (with a 2 pixel border in between each image)
- four images of varying sizes in a 2/3 - 1/3 relationship
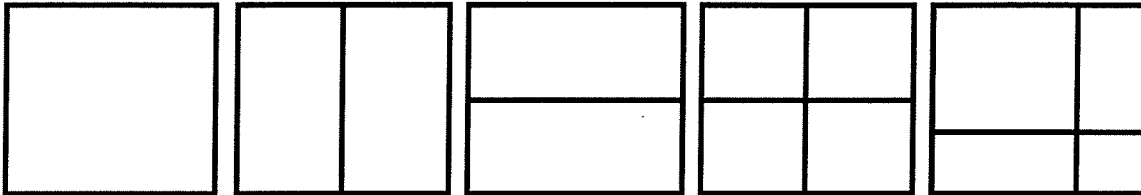
Figure 15.   Content Image layout formats for the SCD web site

The rationale for this type of formatting was consistent with the other design decisions made in the formatting of the SCD web site.   It is simple, easy to understand, and visually appealing.   This format also provides opportunities to fit most images effectively into one of the five formats, while still maintaining the consistent page format. It provides multiple options with which to achieve maximum visual effect / impact, through the use of a single image or a series of images in relation to one another.

4.3 Visualization Process / Strategies:

Flow charts were developed to aid in the decision making process for the visualization of each concept on the SCD web site.   An example of these charts (Figure 4.) can be found on the following page.   The flow chart takes the author through the issues surrounding each visualization decision.   It essentially poses a series of questions that when answered will indicate the best strategies for visualization of

each issue. In examining figure 4 you will see that the outcome of the two strategies diagrammed could in one case be any of six choices of visualization strategies, and in the other case any of three. This represents a best case scenario based on the idea that the authors had both the time and visual resources to attempt each strategy and decide which would be best. In reality, the amount of visual information on each issue possessed by the authors was in most cases quite limited. Often the visualization decision for a given topic was a forgone conclusion, with little or no choice available.
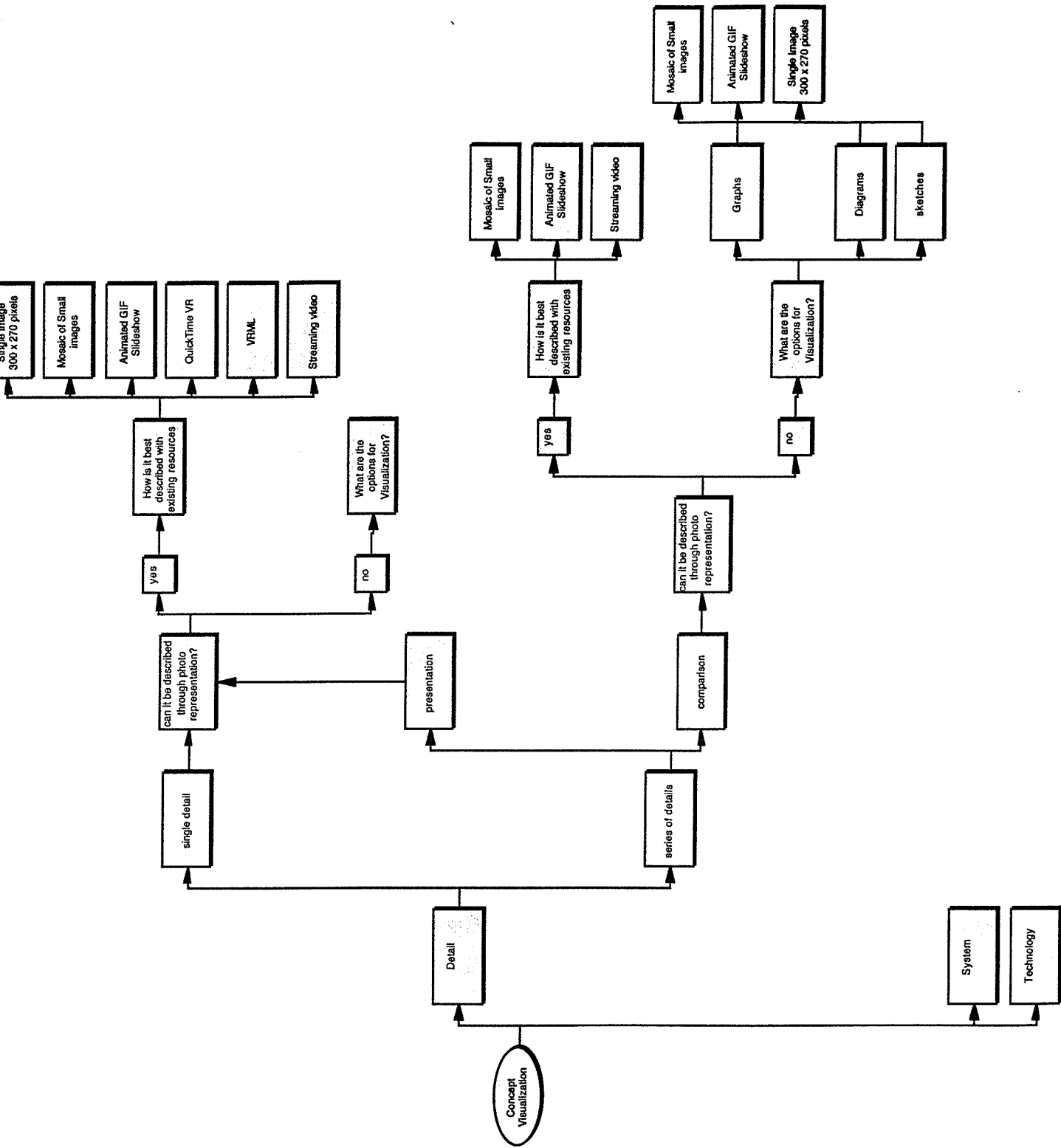
Figure 16 . Flow chart describing the visualization process undertaken for the SCD web site

4.31 Image File Types:

Each image file type outlined in Chapter 2 has a specific function in the visualization scheme of the SCD web site. Almost all of the image files on the web site are saved in JPEG format due to the presence of more than 256 colours in the photographs, and the JPEG format's superior file compression ratios over GIF images. The only photographic images saved in a GIF format on the SCD web site are those images which comprise part of an animated GIF file. Photographs and other graphic material have been used in the following manner under optimal conditions on the site. It is important to note that in most cases optimal conditions were not present, so other arrangements were made to adequately visualize each community or design feature without the best possible visual information.

Figure 17 . Greenhouse and pond, Slagelse Denmark
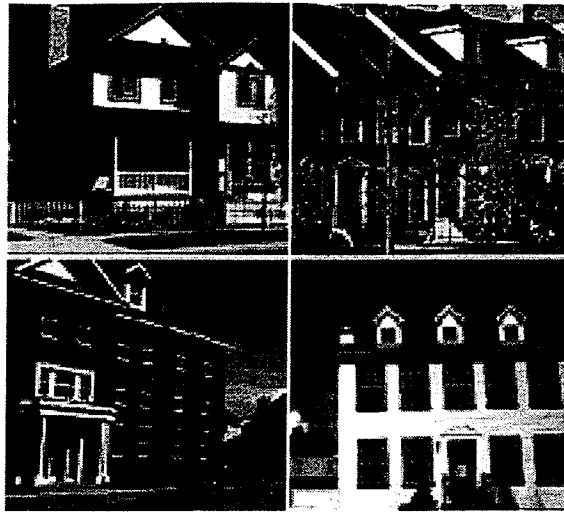
Figure 18. Housing Types from McKenzie Towne, Calgary AB. Canada

Single photographs have been used on the SCD web site to illustrate a detail or space. Figure 17 gives the user a view of one of the main features of the open space development at Slagelse, Denmark.

Mosaics of 2 to 4 images have been used to facilitate comparisons of certain types of information within an information series. Figure 18 allows the user to examine the relationship between a series of images, in this case some of the architectural styles present within the community of McKenzie Towne located in Calgary, AB, Canada..

A mosaic of images has also been used to illustrate a series of details within a certain category of investigation on the site. Figure 19, taken from the Kolding case study, illustrates a series of elements within the community which have to do with water use and conservation.
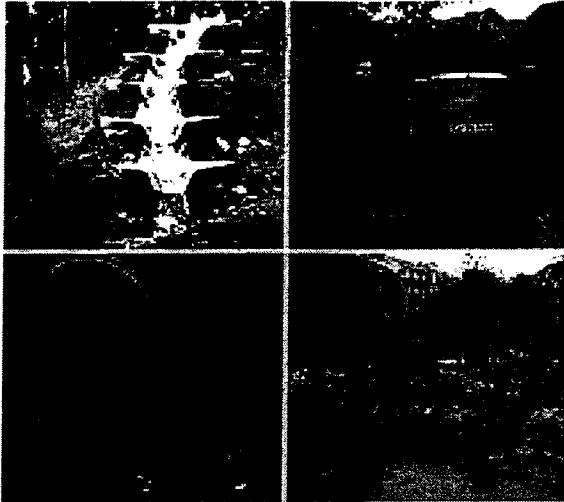
Figure 19. Water Conservation
Measures at Kolding, Denmark
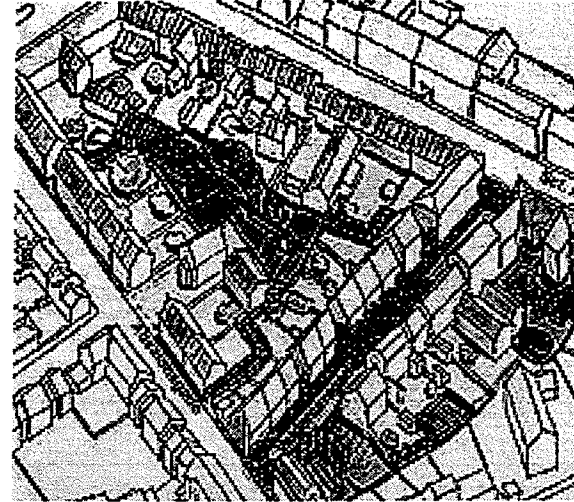
Figure 20. Axonometric of Open space
at Slagelse, Denmark

Diagrams and axonometric or perspective drawings have been used in the web site to illustrate whole systems, spaces or concepts. Figure 20. gives an overview of the open spaces that were carved out of the central housing block at Slagelse, Denmark.. This diagram allows the description, in a single image, of a complex system that would be difficult to describe solely with photographs or textual material.

Axonometric and perspective drawings have also been used at the beginning of many of the community case studies to illustrate the layout and scale of each community. These drawings not only illustrate the scale of the community in terms of horizontal dimensions, but also give the reader an understanding of the vertical dimensions and the character of the space. (figure 21)
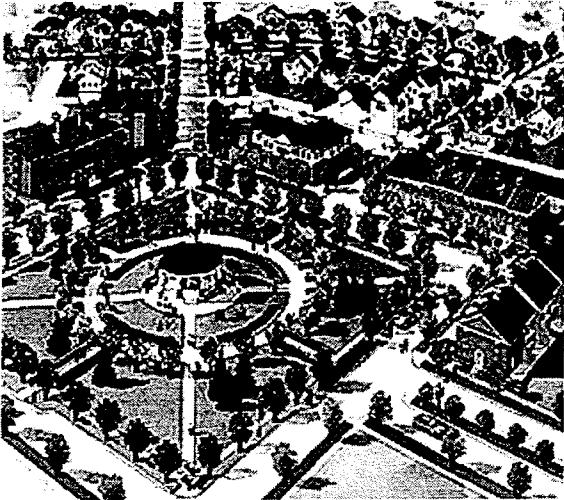
Figure 21.   The Inverness town square, McKenzie Towne, Calgary AB. Canada

4.32 Animated GIFs

Animated GIF files have been used in the web site where a simple mosaic of images would not provide sufficient space to communicate necessary information effectively, or where the properties of an animated GIF file lent themselves to effective communication of information.   Animated GIF files are used in 3 ways first, as a slide show; second, as a time lapse photography sequence; and third, as a video or animation sequence.

In the case of a slide show, the page is loaded, and each graphic in the file is shown briefly, in series. Accompanying text may appear either within each graphic of the animated file, or as part of the fixed text information on the left hand side of the screen. Figure 22 shows two files included in the animated GIF of a before and after sequence from the Kolding case study.

Before   **After**

Figure 22. two files included in the animated GIF of a before and after sequence from the Kolding case study

In other cases the images appear more like an animation or video sequence, or a time lapse photography sequence. In the case of time lapse photography the bulk of the images will remain constant throughout the animation sequence, while one element of the image, the plant material for instance, will appear to grow or change.

Video sequences using animated GIF files are time consuming to construct and memory intensive. The authors of the SCD web site decided that it would be much more effective to use video streaming technology than to try to make an animated GIF video.

Animation sequences using GIF89a images also proved useful in directing the user's eye from one part of the image to another in a sequence designed to inform the process of education being undertaken. Arrows or more complex animated tools can be made to appear on an image to illustrate a point, highlight one particular detail of the image, or illustrate a sequence of events. An example of

this is the following diagram of the workings of the waste water pyramid at Kolding (Figure 23). In this animated file a series of arrows appear in sequence to illustrate the flow of waste water through the system. Additionally information can be timed to appear with each arrow to explain the functions of each part of the system.
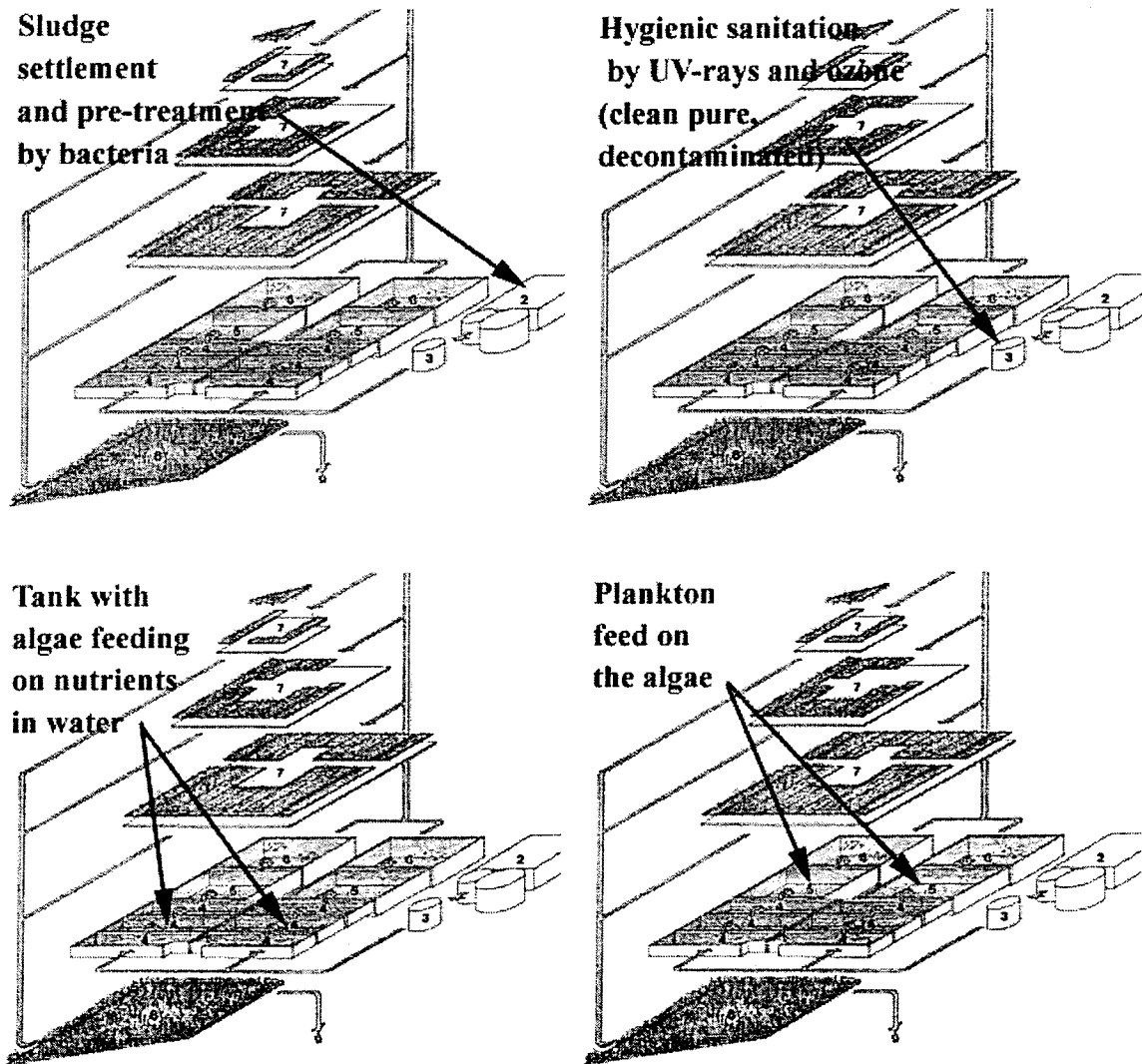
Figure 23. Four frames from an animated GIF file explaining the workings of the waste water pyramid at Kolding, Denmark.

4.33 QuickTime VR

QuickTime VR is an excellent tool for illustrating the character of a space and the relationships and scales of a community from a human perspective. Optimally QuickTime VR tours would have been created for each of the case study communities, but time and resources limited its implementation on the site. There is one demonstration of the effectiveness of QuickTime VR in the McKenzie Towne case study. The address of that file is:

http://www.cadlab.umanitoba.ca/la_www/sustainable/cases/mckenzie/mac002.htm

4.34 Video:

No video was generated specifically for the web site due to time and budget constraints. However, there were two existing video sequences identified by the authors for inclusion in the SCD web site.

One of the files was 90 seconds in length. If the viewing window for this video clip were kept constant with the format of other graphics on the site, 300 x 270 pixels, the file would have been in excess of 30 megabytes. This would take a minimum of ten minutes to download to a user's computer if the transfer speed was above 40k per second. Due to the extreme size of this files, once it was converted to a QuickTime video sequence, it was not implemented on the SCD site. The other file, while a shorter sequence, was not implemented for similar reasons.

While video can be an extremely effective tool in the visualization process, the authors decided that 10 + minutes of download time was excessive. This was perceived to interfere with the learning process.

4.35 Virtual Reality Modeling Language (VRML):

After examining the visualization possibilities afforded by VRML technology, the authors of the SCD web site decided not to implement this technology for two major reasons. First, it is extremely time consuming to create a 3 dimensional computer model of a community, or even one building, and have it detailed enough to describe adequately the issues inherent in sustainable community design.

Second, VRML is a technology that makes use of completely computer generated information. The goal of the SCD web site is to help users visualize a sustainable community, and the strategy employed to that end was to make use of photography of actual communities and sustainable features. With the advent of add-on programming techniques to QuickTime VR, hotspots can be used to link VR files together, giving an approximation of the kind of walk-through that VRML provides, but using photographs instead of computer generated imagery.

4.4 Chat rooms and interactive Forums:

The authors of the SCD web site set up a series of interactive forums to facilitate the discussion of SCD related information on the web site, and to provide some interaction and feedback between them and the

users of the site. It was hoped that this would provide a visual forum as well as a textual one. It was possible for users to reference the web site and to include pictures in their commentaries. However, there were some drawbacks. First, users had to know the HTML code for inserting an image <img src="location of the file"> in order to include one with their message.. Second, users could only reference images that were already located on the internet. This meant that users had to be quite sophisticated in their use of the computer to be able to reference and include images in their discussions.

Initially the web site contained 11 interactive forums. One for each of the 9 design feature categories, one for the case studies, and one for miscellaneous discussions. After a few months of inactivity on the forums, this was reduced to just one forum in hopes that a large general discussion could be started, and then divided up as necessary. In the end there were only three postings made to the SCD forums over the 18 months that they were on the site. The authors had believed that "if they built it, users would come". This turned out to be a false assumption.

While the site itself has enjoyed over 6000 visits the possibilities of the interactive forums have been largely ignored by the users and the authors of the site. While the exact cause of this is unknown, the general consensus of the authors of the site is that forums, such as the ones on the SCD site, need to be kick started or seeded with commentary and discussions in order for the visitors of the site to feel that they are "safe" to participate. This author's personal

experience as a member of the LARCH-L listserver, indicates that many people are reluctant to participate, even in the most general discussion, unless they feel that they have something specific to offer, or a question to ask. The exact purpose of the forums, or the kind of participation the authors were seeking, was not made obvious anywhere on the web site. Thus not making it safe / easy for users to participate.

4.5 Summary:

- The sustainable community design project was developed for the WWW because of opportunities provided by hypertext for non-linear navigation, and because of the internet's increasing accessibility and low cost for publication.

- The format of the SCD web site is based more on CD-ROM multimedia encyclopedias than it is on any current web site format.

- Of the six file types that were identified in chapter two as offering strategies for visualization, only four were implemented on the SCD web site: GIFs, Animated GIFs, JPEGs and Quicktime VR.

- The opportunities for discussions provided by the On-line forum developed for the web site was never taken advantage of by users or the authors of the site

Chapter 5

5.0 Conclusions and Recommendations:

Two years after its inception the Sustainable Community Design web site remains a unique experiment, both in terms of the visualization of a complex concept, and in terms of its implementation as a multimedia World Wide Web based document. Its uniqueness lies in its inclusion of large quantities of graphic information combined with descriptive text; the hypermedia integration of the document, which server to bind the information set together as an independent web; and the project's focus as an educational resource. To this author's knowledge, no other site on the internet has incorporated a similar implementation strategy for dealing with a concept with such an inherent level of complexity as is sustainable community design.

While the aims and achievements of the SCD web site remain unique, problems with this strategy of information communication have become apparent throughout the design and implementation process. As shown previously in chapter 4 in the decision making flow charts, one of the key stumbling blocks for this research has been the lack of availability or development of appropriate visual material with which to properly illustrate each design feature or case study in the web site. By examining the decision-making process it becomes clear that at the end of each decision-making sequence there are typically 3 or more options of appropriate methods for visualizing each detail, system or concept. This suggests that the authors should have developed visual information in each of the 3+ file types and then

assessed which of these was the most effective in communicating the information. The authors of the SCD web site did not have access to sufficient graphic material to undertake this process. This was one of the greatest challenges in achieving the goals outlined at the beginning of the research project. All of the visual material on the site, with a few minor exceptions, was gathered before the SCD project was undertaken, by other professionals, for unrelated research purposes. This meant that in many cases the visual material on hand was not optimal for its intended purpose on the SCD web site. This lack of visual material led to reliance on the use of photographs over animated GIFs, QuickTime VR files, or video sequences. As a result, the Case Studies section of the site, which includes over 150 images, only includes one animated GIF file, and one QuickTime VR file. Optimally each of the community case studies would have employed all of the possible visualization strategies, possibly including a QuickTime VR tour, animated GIF sequences of before and after shots, short video clips to illuminate certain features of each site, diagrams and drawings where appropriate, as well as photographs. Many of the issues in the Design Features section could have benefited from diagrammatic work in addition to the photographic images that were gathered for each piece.

As of August 1998 the SCD web site is still unique on the internet for its scope of both textual and visual content. None of the sites listed in the related links section of the web site approach the level of complexity and thoroughness of the SCD web site.

5.1 Recommendations for the SCD web site:

The following is a short list of recommendations that if addressed could lead to improved functioning, as well as improved user understanding of the SCD web site:

1. In future versions of the SCD web site two editions of the site should be produced. A CD-ROM edition, created with *Macromedia Director* TM or *Authorware*TM, and another edition created in HTML for the World Wide Web. These editions would allow full advantage to be taken of each technology. Currently the web site is a hybrid of the two formats. As a hybrid of WWW and of a CD-ROM formats, the site does not reach the full potential of either. This hybrid is the result of a constraint leveled by the major funder of the SCD web site initiative, Canada Mortgage and Housing Corporation (CMHC). CMHC required that a CD-ROM with the information on it be produced as a final product. The authors of the site wanted to make use of the WWW as the publication / distribution method for the information.

   Over 6000 people have accessed the Sustainable Community Design web site to date, with limited or no advertisement of the information on or off the WWW by the authors. This demonstrates that there is a sizable audience actively looking for SCD information on the WWW. This level of interest validates the decision to distribute sustainable community design information via the WWW. Without WWW distribution, the site would not

have been seen by anyone not directly involved in its development.

2. While the SCD site makes extensive use of hypermedia links internally, it should also be linked to existing external WWW resources. External hyperlinks were eliminated because users accessing the information from a CD-ROM might not have access to the WWW. Theses links would be of no value to them, and might cause error messages interrupting their learning sessions. By eliminating external hyperlinks in the body of the web site, the authors failed to take advantage of the existing body of knowledge present on the WWW. This lack of external hyperlinks ignores one of the major strengths of the WWW, its ability to allow simple cross-referencing and linking of information from disparate and geographically diverse sources.

3. Another opportunity missed by the authors of the SCD web site was provided by memory intensive technologies such as video. Two existing video sequences were identified as having potential for use on the web site, but these were not used due to their length and the resultingly large files created. Downloading these files, even from a fast internet connection, would have taken a minimum of ten minutes which would frustrate many users. CD-ROM technology has the capability to include long video sequences. The two identified for the site would not have posed any problems in terms of speed and accessibility from a CD-ROM product.

4. The insight gained from the visual descriptions of some of the community case studies could have been increased through the use of QuickTime VR, animated GIFs, and video sequences. As noted, the information for such illustrations was unavailable to the authors of the site throughout its development. Optimally, this information would have been gathered through site visits by the authors, especially in those cases where photographic information itself was limited, such as with the Ecovillage at Ithica case study. Site visits were complicated by the fact that all of the community case studies are located at a great distance from the University of Manitoba campus. In a further edition of the web site the authors should either secure funding for travel to perform site visits, and / or develop contacts and partnerships with individuals who live in the Case Study communities. These individuals could be effective in gathering the information necessary and send it to be included in the web site.

5. An effective tool for increasing the navigability the SCD web site would be an internal search engine. An internal search engine would allow users to do keyword searches of the files on the entire Sustainable Community Design Web Site, thus helping them find the information they are seeking more quickly.

6. A visual map of the whole web site or multiple maps of smaller portions of it, could be an effective tool for aiding users to

visualize the structure of the site, thus facilitating more effective navigation of the information.

7. Efforts should be made to re-introduce the glossary of terms in further versions of the SCD web site. .The Glossary of Terms was an important tool that was initially included in the web site. The glossary made the language of Sustainable Community Design more accessible to new users. Hypertext was employed to link terms in the body of the site to the glossary. It was removed from the site due to time and programming constraints.

8. The SCD web site would benefit from increased interactivity. At present the navigational structure is the only interactive aspect. Through games and quizzes users could be given the opportunity to interact with the material. This might be an effective tool to enable them to combine concepts, enhancing their learning and breaking up the monotony of the site.

9. Subsequent versions of the site should include ways for users to print out each case or section of the SCD web site more simply than is currently possible. Users' ability to print out information from the web site is currently limited and cumbersome. This is due to the fact that each case study, or section of the web site, is divided up into multiple small files. Printing requires accessing each file individually. There is currently no way for users to print out an entire section more efficiently. One comment received from a user of the site criticizes the site's multiple small page

format for just this reason. While research evidence suggests[58] that the current format of the web site is more appropriate for on-line viewing than having each section of the site appear as one long file, the latter would make printing the information much simpler. One way maintaining the current format while addressing this problem would be to provide a PDF file of each section or case study which could be downloaded and printed out.

10. A final recommendation is that the authors of the SCD web site should examine acquiring a shorter, more unique address for the site along the lines of *http://www.scd.ca* which might help users find it and return to it more easily. This type of address may also suggest to the experienced user that the web site is a long term venture as the authors obtained a unique address for it, rather than just placing it on an existing server.

5.2 Recommendations for Further Analysis and Study

The following is a short list of recommendations for the further analysis and study of the process of visualization and communication undertaken on the SCD web site.

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[58]Soulier, J. S. *The Design and Development of Computer Based Instruction*, Allyn and Bacon Inc. Toronto Ont. 1988. p.168
Criswell, E. L., *The Design of Computer Based Instruction*, Macmillan Publishing Company, New York. 1989 p. 82
Price, R. V. *Computer-Aided Instruction, A Guide For Authors*
Brooks/Cole Publishing Company, Pacific Grove, California, 1991. p. 131
Steinberg, E. R., *Computer Assisted Instruction: A Synthesis of Theory, Practice and Technology.* Lawrence Erlbaum Associates, Publishers, Hillsdale New Jersey, 1991. p 154

1. Communication of information about sustainable community design is improved by a greater understanding of factors which effect users perceptions of the information. The effectiveness of digital documents, such as the SCD web site, depends on this greater understanding. Factors which affect a users understanding and interpretation may include cultural background, technological familiarity, and previous experience. These factors will also affect their understanding of complex or new concepts, such as those inherent in sustainable community design.

Several ways for presenting information to enhance users' understanding of the complexity of sustainable community design were postulated and then implemented during the SCD Web project through its integration of the WWW and multimedia technology. The SCD web site provides an opportunity to function as a forum or case study for an examination of how users perceive information presented in this format. Questions for investigation could include:

- How do users perceive graphic versus textual descriptions of design features or community case studies?
- Are there certain types of graphic material which users perceive more readily than others?
- Does the complex structure of the information on the SCD web site enhance or impede users understanding of its content?

Designers need to consider the way in which the answers to these questions affect their efforts to communicate information via a digital medium..

2. A detailed investigation into the effectiveness of the visualization strategies employed by the SCD web site is an important next step. The process of visualization undertaken in the SCD web site was time consuming and difficult. It remains a virtually unique experiment on the WWW two years after its inception. Criswell[59], Price[60], and Steinberg[61] all outline ways of assessing the effectiveness of computer based instructional software. These strategies would be a good starting point for evaluation of the project.

3. More work needs to be done to solicit commentary from the 6000+ users who have visited the SCD web site. This is necessary to judge the effectiveness of the process that produced the site and the effectiveness of the site itself. Very little feedback was solicited or received regarding the site. The on-line forum attached to the site only generated three questions and / or comments over its 18 month life span. The on-line forum experienced many difficulties over the two years due to software and hardware bugs on the system. Even when working it was never really used, even by the authors of the site. With such a forum it may be important to generate traffic and questions in-house, to make the forum look busy. This will indicate to users

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[59]Criswell, E. L., *The Design of Computer Based Instruction*, Macmillan Publishing Company, New York. 1989 p.
[60]Price, R. V. *Computer-Aided Instruction, A Guide For Authors* Brooks/Cole Publishing Company, Pacific Grove, California, 1991.
[61]Steinberg, E. R., *Computer Assisted Instruction: A Synthesis of Theory, Practice and Technology.* Lawrence Erlbaum Associates, Publishers, Hillsdale New Jersey, 1991.

the kind of discussion / questions that are appropriate. Without this kind of initiation, users might shy away from the forum, because they do not want to be the first participant to comment on the site or the first to ask a silly question.

5.3 Final Word:

As a final note to this document, this author believes that while it was stated earlier that no one discipline of the traditional design disciplines could effectively "go it alone" in the design and implementation of a sustainable community, landscape architecture becomes the key discipline among those that make up the design and development framework for such a community. Of the 9 design feature categories outlined by Perks and van Vliet in *Assessment of Built Projects for Sustainable Communities*[62] only landscape architecture, among the design and planning professions, addresses issues in each one. If sustainable community design represents the future for community design and development then Landscape Architects should be key players in its development.

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[62]Perks, W. T. and D. Van Vliet. 1993 *Assessment of Built Projects for Sustainable Communities.* Canada Mortgage and Housing, External Research Program, Ottawa. Draft

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Perks, W.T. Van Vliet, David R.."Sustainable Canadian City in the Year 2020: A History of Beginnings at Willmore and Calgary"; in *Vision of Life in a Sustainable 21st Century Canadian City.* Ottawa: Centre for future Studies in housing and Living Environments, Canada Mortgage and Housing. 1993

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Perks, W.T., Wilton-Clark, A., *Consumer receptivity to Sustainable Community Design,* Faculty of Environmental Design, University of Calgary, 1996

Perron, R. Epp, E. *Computer Visualization Technologies to Evaluate Design Alternatives for a Sustainable Community with Reference to Edgemont, Calgary, Alberta.* A HyperMedia Document, Ottawa: Canada Mortgage and Housing Corporation (CMHC), the Faculty of Architecture, University of Manitoba. 1995

Perron, R., Epp, E. Application for Housing Research Grant, CMHC 1995.

Price, R. V. *Computer-Aided Instruction, A Guide For Authors* Brooks/Cole Publishing Company, Pacific Grove, California, 1991.

Soulier, J. S. *The Design and Development of Computer Based Instruction,* Allyn and Bacon Inc. Toronto Ont. 1988.

Jack Todd, N., Todd, J. *From Eco-Cities to Living Machines: Principles of Ecological Design* North Atlantic Books, Berkeley Ca. 1994

van Der Ryn, S. and Calthorpe, P. *Sustainable Communities: A new design synthesis for cities, suburbs and towns.* Sierra Club Books: San Francisco CA. 1986

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Visualization Techniques,
http://bamboo.mluri.sari.ac.uk/`jo/litrev/chap3.html
08/10/97

The Sustainable Community Design Web Site
http://www.cadlab.umanitoba.ca/la_www/sustainable/intro01.htm
15/01/98

Guidelines and Principles for Sustainable Community Design
http://fcn.state.fl.us/fdi/e-design/online/9607/thesis/thesis.htm,
1996.

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http://chs.cusd.claremont.edu/www/people/rmuir/rfc1578.html
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07/01/98

Richard Risemberg, A Paradigm for Sustainability, Geocities Web Site
http://www.ficus.usf.edu/exhibits/sustain_exhibit/default.htm
13/08/98

The Education Computer Lab
http://www.umanitoba.ca/edlab/search.html

Huxley College COURSES IN ENVIRONMENTAL STUDIES
http://www.wwu.edu/CampusInfo/AdmRegInfo/Catalog_95/Huxley/
EnvStud.html 15/08/98

Margarita Hill Assistant ProfessorHorticulture & Landscape Architecture
http://www.agnr.umd.edu/users/larc/hill.htm 15/08/98

Sustainable Design Group
http://www.sustainabledesign.com/sdg-svcs.htm 15/08/98

Personal communications:

Edward Flaherty, e-mail posting to the L-ArchL Listserver, 10/07/98

Personal Communication: Helen Bochonko, 1996

List of Figures:

Figure 25.   Flow chart outlining the processes undertaken in determining the visualization strategy for a system on the SCD web site.   Appendix A.

Figure 26.   Flow chart outlining the processes undertaken in determining the visualization strategy for a technology or series of technologies on the SCD web site.   Appendix A.

Appendix A:

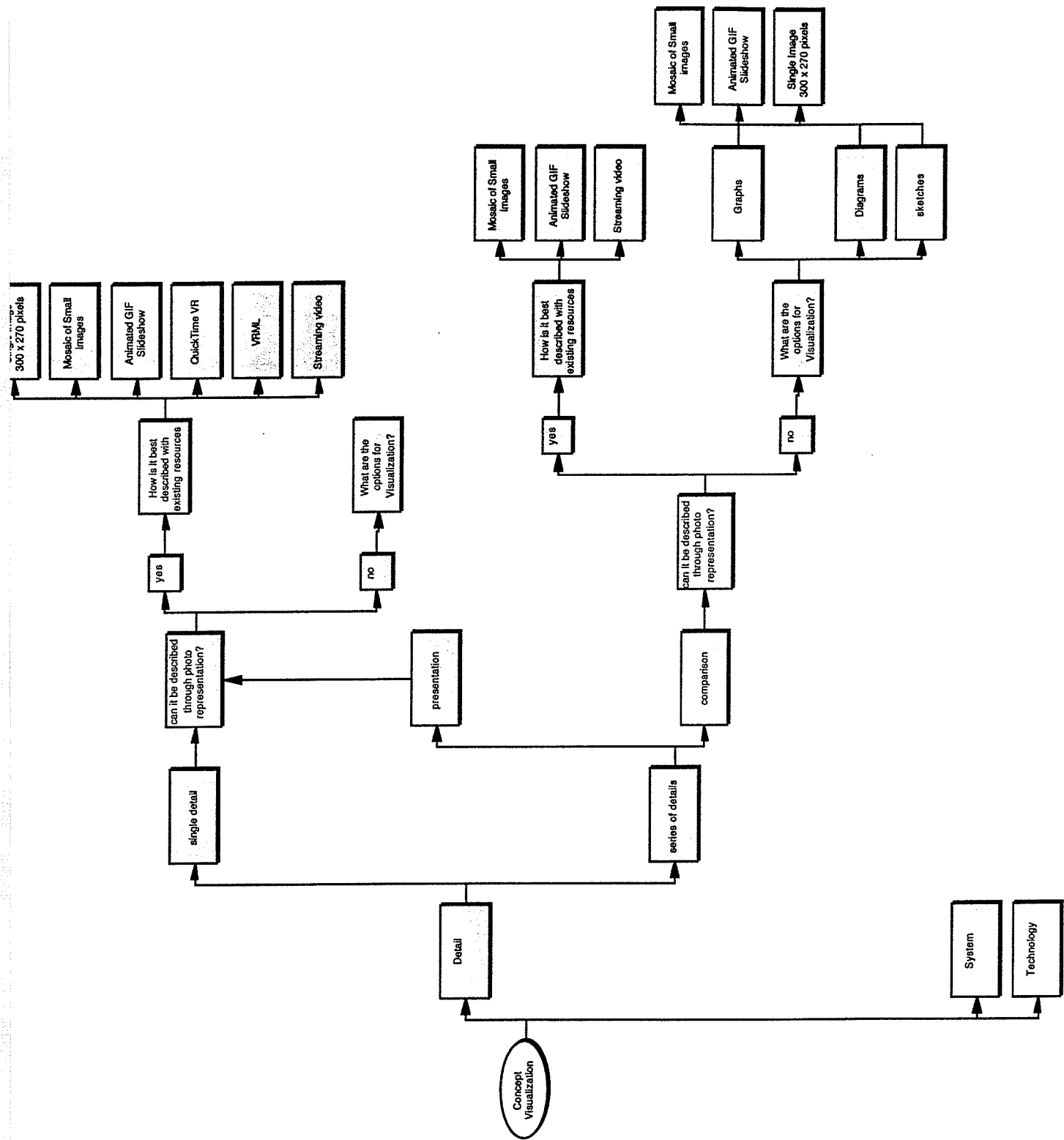## Flow charts for Visualization Strategy Identification

Figure 24.   Flow chart outlining the processes undertaken in determining the visualization strategy for a detail or series of details on the SCD web site.
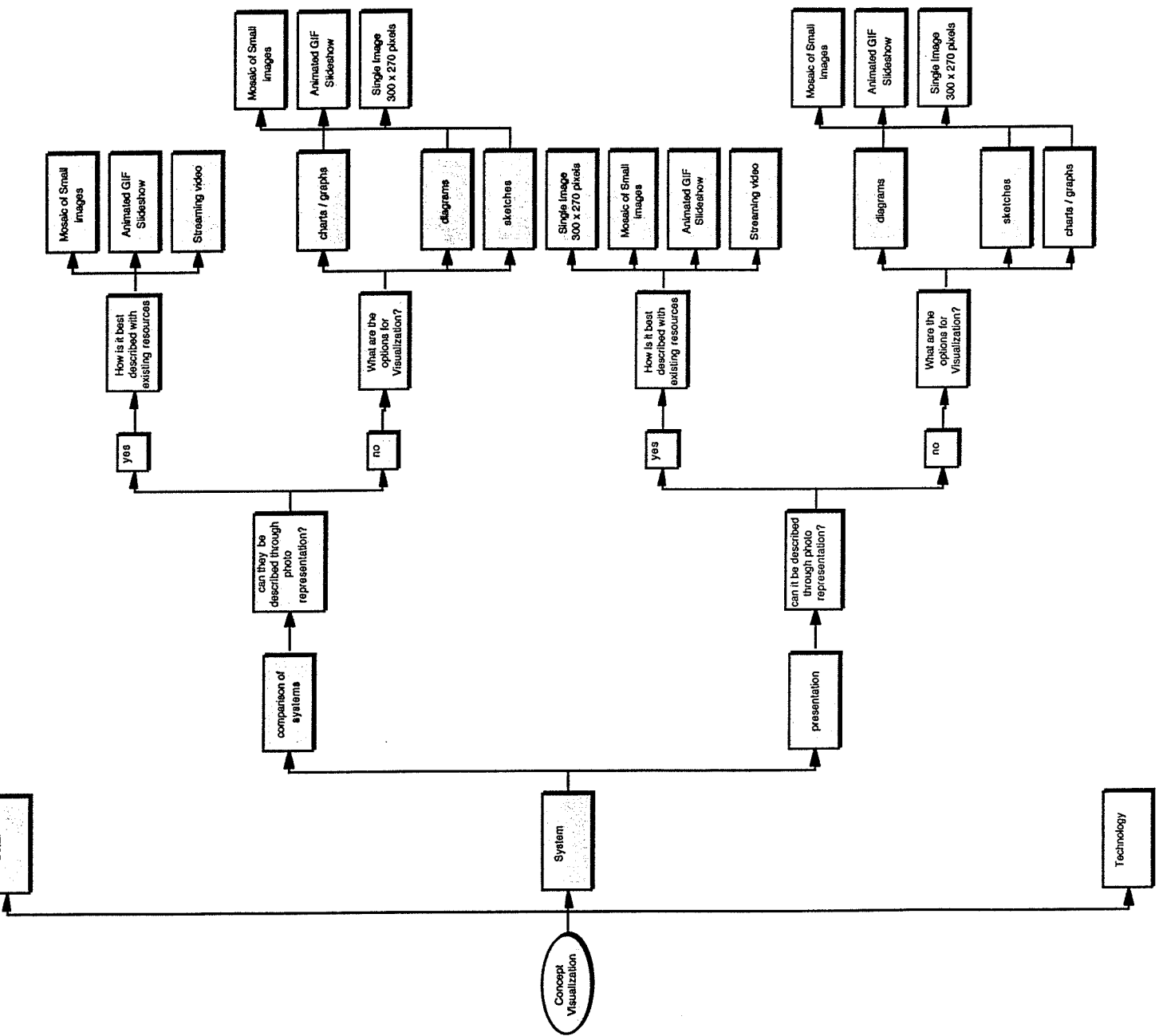
Figure 25. Flow chart outlining the processes undertaken in determining the visualization strategy for a system on the SCD web site.

System

Technology

Concept
Visualization

presentation of a
single technology

comparison of
technologies

can it be described
through photo
representation?

can they be
described through
photo
representation?

yes

no

yes

no

How is it best
described with
existing resources

What are the
options for
Visualization?

How are they
compared with
existing resources

What are the
options for
Visualization?

Mosaic of Small
images

Animated GIF
Slideshow

Streaming video

Single Image
300 x 270 pixels

diagrams

sketches

Mosaic of Small
images

Animated GIF
Slideshow

Single Image
300 x 270 pixels

Mosaic of Small
images

Animated GIF
Slideshow

Streaming video

charts / graphs

diagrams

sketches

Mosaic of Small
images

Animated GIF
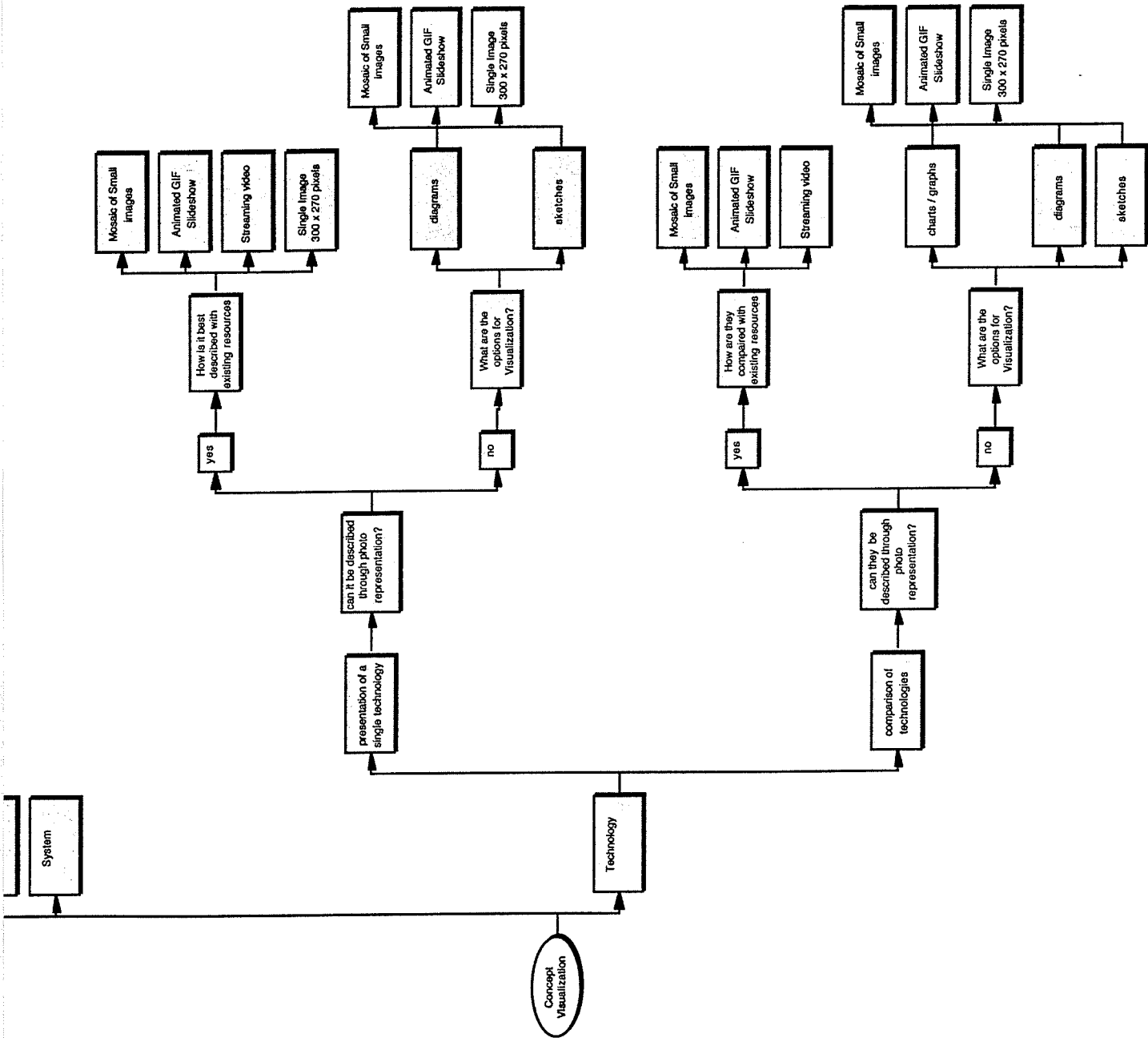Slideshow

Single Image
300 x 270 pixels

Figure 26. Flow chart outlining the processes undertaken in determining the visualization strategy for a technology or series of technologies on the SCD web site.

Appendix B:

Web Site Criticisms

Graphic structure and hypertextual integration criticisms of Sustainable Community Design Related Web sites

Ecovillage at Ithica:

http://www.cfe.cornell.edu/ecovillage/

The Ecovillage at Ithica site combines some visual information on their web site with a brief description of the community. The information appears in one longish page with three graphics, one of which has a caption included along with the text. The site includes a Hyperlinks to a page with a listing of the development guidelines for the site, and one image of the site before construction. No real attempt seems to have been made to match the images included to the text on the pages. The site makes no real attempts at visualization but rather just a few cases of illustration. There is also a photo gallery which include 4 images each with a 2 word description. No hypertext integration.

Civano, Tuscon Arizona:

http://www.civano.com

Similar layout to ecovillage at Ithica site. All graphic information is held separately from the main textual information about the project. This project has not yet begun construction which may account for the lack of visual information included on the web site, but from the layout that is currently implemented it does not appear that visualization will be an issue addressed by the web site. No hypertext integration.

European Academy of the Urban Environment:

http://www.eaue.de/winuwd/list.htm

This site contains a large selection of European Sustainable development case studies (over 80) including at least two of the case studies communities documented in the SCD web site. Each case includes roughly 2000m words. There is no graphic information at all on this web site, and there is not hypertextual integration of the cases.

Sustainable Communities Network:
http://www.sustainable.org/index.html

A large web site with links to case studies as well as issues that have been of features that have been identified as part of a sustainable community. The site lacks graphic illustrations, but has some hypertextual integration within related sections. There do not appear to be any links out of each section to other sections, for example there are no links from the protecting natural resources section to the issues outlined in the living sustainably section.

PIX photographic Information Exchange
http://www.nrel.gov/data/pix/pix.html

The Photographic Information eXchange (PIX) collection consists of renewable energy and energy efficiency technology photographs. This is a search-able archive of pictures, there is no textual information to accompany the images, not is there hypertextual integration of the different issues archived on the site.

Marsh Commons Co-housing
http://redwood.northcoast.com/~startrak/welcome.html

This site consists of 2 main pages with a description of the project, which is a 12 unit co-housing community in Arcata California. The site contains a brief description of the project as a whole and information about the recycled building materials being used in the project. The second page of the site has information about the current community members, as well as links to design drawings. There is no hypertextual integration of the issues outlined in the site.

Sustainable Architecture Building and culture
http://www.west.net/~prince/

This site is an archive of other sustainable architecture sites on the WWW. It has not real content unto itself other than the description of the sites that it links to.

tsui Design and Research Inc.
http://www.TDRInc.com/

An architectural web site, tsui design and research contains several
housing case studies and principles of architectural conservation.
The case studies include graphic integration, but require scrolling
between graphics and the text describing the graphics. There is no
hypertextual integration of the web site.

**FICUS: The Florida Internet Center for Understanding
Sustainability**
http://www.ficus.usf.edu/

FICUS is a large site containing multiple research reports on
sustainable design and development issues relating to the state of
Florida in the United States. The site contains some graphic material,
and some hypertextual integration of the information within the site,
but the graphic format of the site is not consistent from page to page.

Guidelines and Principles for Sustainable Community Design
http://fcn.state.fl.us/fdi/e-design/online/9607/thesis/thesis.htm

This site is a masters thesis completed in 1996 for Florida A&M
University. It contains no graphic material, and no hypertextual
integration of the textual information within the document.

Appendix C:

Diagram of the
Sustainable Community Design
Web Site