# HEALTHY RESIDENTIAL DEVELOPMENTS: REDUCING POLLUTANT EXPOSURES FOR VULNERABLE POPULATIONS WITH MULTIPLE CHEMICAL SENSITIVITIES

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# HEALTHY RESIDENTIAL DEVELOPMENTS: REDUCING POLLUTANT EXPOSURES FOR VULNERABLE POPULATIONS WITH MULTIPLE CHEMICAL SENSITIVITIES

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This is bigger than AIDS.
-- Ann McCampbell, M.D., Chair, Multiple Chemical Sensitivities Task Force of New Mexico

I did the Greencase to pay off one hell of a karmic debt.
-- Amelia Conrad, (pseudonym) owner of the Greencase (pseudonym), South Morris (pseudonym), Florida

People with chemical and electric sensitivity are vulnerable to regular assault by people who are perfectly nice and mean them no harm. It is equivalent to bludgeoning or being hit with broken glass. …We exhibit behaviors of battered women. It makes us distorted that we have to defend ourselves all the time, but we don't have the legal right to defend ourselves. …We are losing people. …Word on the street is that the suicide rate is 20%.
-- Rachel Kirkman (pseudonym), founder of the Ecology Group (pseudonym), visionary behind Ecocase (pseudonym) in Nadal (pseudonym), California

To the next generation of children, may you be less sick than this one.

To my own children, may you lead the way.

To all those sick from chemical exposures, may you find hope in these pages.

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I wish all dissertators could have such wonderful advisors, family, and friends as I have.

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| | |
|---|---|
| ADA | Americans with Disabilities Act |
| AHIL | Ariel Homes for Independent Living (pseudonym) |
| CDBG | Community Development Block Grant |
| CDC | Centers for Disease Control and Prevention |
| EGP | Ecology Group (pseudonym) |
| EHA | Environmental Health Association (pseudonym) |
| EMF | Electromagnetic field sensitivity |
| HEPA | High efficiency particulate air |
| HUD | Department of Housing and Urban Development |
| ILC | Independent Living Centers |
| IPM | Integrated pest management |
| LBAM | Light brown apple moth |
| LEED | Leadership in Energy and Environmental Design |
| MBH | Metro Bay Housing, Inc. (pseudonym) |
| MCS | Multiple chemical sensitivities |
| USDA | United States Department of Agriculture |
| VOC | Volatile organic compound |

# SUMMARY

Many serious illnesses are linked to everyday exposures to toxic chemicals. In the U.S., most chemical exposure comes from common consumer products such as pesticides, fragranced products, cleaning supplies, and building materials—products so widely used that people consider them "safe." As the links between everyday toxic exposures and potential health effects become better understood, evidence increasingly shows that reducing exposures can create a healthier society. Although some individuals may choose to build a healthy home and maintain a healthy household, they are still exposed to pollutants at their residences from the actions of others, such as to pesticides that are used by neighbors, businesses, and governments. They need healthy residential developments in environmentally healthy communities.

This research investigates "healthy residential developments," defined as a property that aims to reduce pollutant exposures to the extent required by vulnerable populations, which for this research are individuals with multiple chemical sensitivities (MCS). Through a case study approach, this research investigates two exemplars of healthy residential developments, and explains how and why they form and continue. It also examines their implementation methods, and implications for planning and policy.

Primary data collection methods included in-person interviews, telephone interviews, and site visits. Research strategies included the analysis of interview data, and categorical aggregation using thematic categories within and across cases. The categories focused on factors of formation and continuation for the two healthy residential developments.

Findings include the challenges of people disabled with MCS to find safe housing; the importance of planning to address these challenges; the role of individuals, funding, and zoning in the formation of healthy residential developments; the role of funding, safe maintenance, and property management in their continuation; and, the need for affordable and safe housing for vulnerable populations.

Future research can address the need to develop methods to create and sustain healthy residential developments, understand and reduce sources of exposure that initiate and trigger chemical sensitivity, and investigate experiences and implementation strategies in other countries.

# CHAPTER 1: A FOCUS ON HUMAN EXPOSURE REDUCTION

## Background and Motivation

Urban planning, since its roots in the social reform and progressive movements of the late 1800s, has been concerned with public health. Public health improvements to the human environment began with the provision of garbage, sewer, and water services, thereby reducing exposure to pollutants (Barton 2000; Kushner 2007; Frumkin et al. 2003; Corburn 2004). The 1970s marked the birth of the environmental movement through which grassroots activists championed the cause of pollutant reduction and health, and ushered in an era of civic environmentalism (Dewitt 1994; Landy et al 1999; Knopman et al. 1999). The work of planners, public health officials, and policymakers contributed to the control of pollution and the improvement of air, soil, and water quality. Landmark federal legislation for the environment, for example, promoted efforts to control lead to improve the safety of homes, significantly reducing children's lead exposure, and creating measurable public health improvements.

Yet lead is just one of thousands of known or potentially toxic pollutants to which humans are exposed (Wallace 1987; Wallace 1989). These pollutants enter our bodies though air, soil, water, foods, and consumer products, and through inhalation, epidermal, and ingestion exposure routes, as well as in utero–the first human environment. The U.S. Centers for Disease Control and Prevention (CDC) monitors the American population for exposure to environmental chemicals, finding dozens of industrial pollutants in samples of our blood, hair, and urine, and in the amniotic fluid of pregnant women – all places where pollutants are not supposed to be (CDC 2009).

Everyday pollutant exposures can contribute to a range of serious illnesses, including asthma, diabetes, cancer, Alzheimer's disease, Parkinson's disease, infertility, migraines, endometriosis, lupus, birth defects, and developmental disorders, such as learning disabilities (Ott and Roberts 1998; Baskin et al. 2001; National Cancer Institute 2002, Paulozi 1999; Swan et al. 1997; CDC 2005; Schettler et al. 2000a; Schettler et al. 2000b, Schettler 2001; Schettler et al. 2002; Boyle et al. 1994; National Research Council 2000; Pronczuk et al. 2002; Ashford and Miller 1998). As the links between everyday exposures and health effects become better understood, public health officials increasingly believe that illnesses attributed to pollutant exposures have led to rising health care costs (Fisk 2001) and that reducing exposure to everyday pollutants can generate both health and economic benefits (Schettler 2002; Mendall et al. 2002).

Many individuals recognize that they are vulnerable to pollutant exposure and can improve their health if they change their personal environment. These changes include the use of integrated pest management (IPM) (rather than pesticides), less-toxic cleaning supplies, fragrance-free personal care products, air and water filters, and "healthy house" materials and designs that reduce pollutant exposure (Bower 1997). Despite individuals' efforts to reduce their personal sources of exposure at home, they are nonetheless exposed to pollutants within their homes from outside sources, often beyond their control. For instance, pesticide exposures occur from spraying done by neighbors, property managers, and government agencies, frequently without consent or advance notice. Exposure to potentially hazardous fragrance chemicals occurs when others use scented laundry products, which are vented outdoors. Exposure to pollutants in paint and smoke occurs from others that paint or smoke in an adjacent unit or area. While these types of

exposures may seem relatively benign, this is not always the case. For instance, for vulnerable individuals, even one of these exposures can be disabling or life-threatening.

Thus, a healthy house approach is not sufficient for reducing pollutant exposure in one's home, because pollutants from others' activities can migrate and impair one's home environment and health. Thus, residential developments need novel approaches to collectively reduce pollutant exposures for individual residents. "Healthy residential developments" in environmentally healthy communities are needed.

Currently, some planning and policy techniques are being used to reduce such exposures. For example, the City of San Francisco passed an ordinance in 1996 that banned all pesticides by 2000, required the notification of pesticide applications by the city, and provided a specialist in integrated pest management (IPM) to work with city employees in making the transition (Small and Raphael 1999). Other cities have reduced exposure to volatile organic compounds (VOCs) and pesticides by mandating the use of lower VOC paints and establishing pesticide-free parks ordinances. Toxic trespass ordinances have attempted to restrict an activity that leads to an involuntary human exposure to a known or potentially toxic pollutant. Additionally, government-housing programs and regulations protect some residents from limited structural problems associated with pollutant exposures (Miles 2005). Yet these are limited examples, with little systematic research on questions about how and why a healthy residential development can be formed and continued to reduce pollutant exposures for its residents.

## Research Objective and Methods Overview

This research defines and investigates the following concept: A healthy residential development is a property that aims to reduce pollutant exposure to the extent

required by vulnerable populations. Vulnerable populations include babies, children, pregnant women, unborn fetuses, the elderly, people with weakened immune systems, people with asthma, allergies, and chemical sensitivities, and people with a history of pollutant exposure, such as factory workers, farm workers, disaster site workers, and war veterans who have had occupational exposure.

For the purposes of this research, and as detailed in Chapter 3, the vulnerable population studied will be individuals with multiple chemical sensitivities (MCS). These individuals are exceptionally vulnerable to pollutant exposures. They have been characterized as "human canaries": they react to pollutant exposure that others would not notice, or that traditional analytic techniques would not capture, and their reactions can be disabling.

To describe briefly, MCS is a condition initiated by acute or chronic exposure to toxic chemicals, such as those in pesticides, solvents, new construction, and petrochemical products (Ashford and Miller 1998). People with MCS suffer effects from pollutant exposures at extremely low levels, such as parts per billion or parts per trillion. This exposure triggers sickness, and a person with MCS may suffer a range of mild to severe health effects, including fatigue, headaches, dizziness, breathing difficulties, and loss of consciousness. The disabling consequences of MCS require "reasonable accommodation" under the Americans with Disabilities Act of 1990 (ADA) and MCS is recognized by many federal agencies, including the Department of Housing and Urban Development (HUD), the Social Security Administration, the Department of Education, the Equal Opportunity Employment Commission, the Environmental Protection Agency, and the National Academy of Sciences. Prevalence studies indicate that at least 11% of

Americans have some degree of MCS—about 35 million people—and that this number is increasing (Caress and Steinemann 2009; Ashford and Miller 1998).

The objective of this research is to investigate and answer the following question: **How and why do healthy residential developments form and continue?** In so doing, it also examines their implementation methods and their implications for planning and policy.

This research uses a *case study approach* to examine healthy residential developments that were intended for residents with MCS. Analytical issues include the following: What factors affect the formation and continuation of healthy residential developments? What private or public actions facilitate or impede healthy residential developments? How do healthy residential developments seek to reduce pollutant exposures? What implementation methods do they use? What lessons can be learned about how to create future healthy residential developments?

To investigate these analytical issues, *data collection* included a range of methods and sources, including interviews of residents and nonresidents, observation of and participation in case studies, review of available documents, information-gathering through letters, calls, and emails to individuals and organizations, and others (as detailed in Chapter 3). A well-crafted interview guide for data collection became the *descriptive analytical framework* for thematic categories, which were 22 factors of formation and continuation for healthy residential developments. Primary strategies for analysis included the direct interpretation of single instances of data, and categorical aggregation to interpret the multiple instances that occurred within a thematic category and sometimes across cases.

In addition, a thorough literature review was used to examine how people are exposed to pollutants in housing and communities, how this exposure causes illnesses, how vulnerable populations are often homeless because they cannot find healthy housing, and how planners and policymakers have a role in addressing the need for healthy residential developments.

## Significance and Outcomes

This research contributes to our understanding of the importance and integration of planning, policy, and public health, specifically reducing pollutant exposures, in the following ways, among others:

It identifies the problem of population exposure to pollutants that cannot be prevented using an individual or house-by-house approach. Virtually no prior research on human exposure to pollutants investigates this problem as it affects individuals with MCS.

It demonstrates how and why planning and policy approaches are needed to address the problems of everyday pollutant exposures to the general public, as well as vulnerable populations.

It creates the concept of a healthy residential development, which adds to and complements existing approaches and concepts in the literature about healthy cities, healthy communities, healthy households, healthy housing, healthy building, and healthy places, as well as green building, sustainable development, and conservation.

It elucidates approaches with the potential to accommodate individuals disabled by MCS, prevent additional individuals from acquiring MCS, and improve public health.

It provides motivation and findings for planners, policymakers, and public health officials to address the problem of reducing human exposure to pollutants.

It potentially contributes to universal design policies, which call for buildings, products, and communities to be accessible by the greatest number of people regardless of their abilities. Such policies could include actions to develop criteria and standards for healthy, energy-efficient, and environmentally safe buildings and developments.

## Scope and Limitations

This research investigates existing healthy residential developments formed for people with MCS. Original, primary data were collected through in-depth interviews at healthy residential developments. Because most interviewees were residents or property managers at housing developments with less than a dozen units, the scope of the research is delimited to characteristics of small healthy residential developments that reduce or eliminate pollutant exposures to the extent required by most people with MCS.

The data deal directly with exposure to pollutants that initiated MCS or triggered symptoms in individuals with MCS. For the most part, this restricts data collection to exposure to chemical pollutants, though the scope of healthy residential developments circumscribes exposures to other types of pollutants as well, such as electromagnetic frequencies, mold, and nanoparticles.

It is not the intent of this research to prove that living in a healthy residential development will cause a person to be healthier, or to measure the "health" of a residential development. It is also not the intent of this research to define toxicity. The word "toxic" is used in this dissertation as it reflects the usage of individuals with MCS when referring to a type of exposure.

Although all available cases of healthy residential developments were investigated, as will be detailed in Chapters 5 and 6, another limitation is the small number of functioning healthy residential developments that exist and were investigated in this research.

This research concerned specific categories of sources of pollutant exposure, rather than all possible pollutants. As described in Chapter 3, 12 categories of pollutant exposure were prioritized for healthy residential developments based on their impact on the functionality of individuals with MCS. These critical toxic exposures include the following: pesticides, cleaning products, new construction or renovations, laundry products, fragrances, chlorinated water, indoor smoke, outdoor smoke, exhaust, fresh paint, and petroleum-based products.

## Organization of the Dissertation

This section provides an overview of this thesis by describing the content of each chapter. This organization presents the introduction, literature review, methodology, data, analysis, results, and conclusions.

### Chapter 1 – Introduction

The introduction provided definitions and motivations for healthy residential developments. The purpose of the research was stated as follows: to explain how and why healthy residential developments form and continue. The significance of this work was described in terms of its research contributions and its applicability and relevance to planning and policy. The scope of the research was delimited and limited. Finally, this "road map" directs the presentation of research within and across eight chapters.

**Chapter 2 – The Need for Healthy Residential Developments**

The first section of this chapter explores the motivation and foundations for healthy residential developments, including sensitivities of individuals to chemical pollutants, effects from everyday pollutant exposures in housing and in communities, and barriers to healthy housing. The second and third sections examine the seriousness of the situation, experiences of individuals with MCS, and the role of planning.

**Chapter 3 – Research Approach and Methodology**

This section details the approach and methods used for the case study research, including data collection, analysis, reporting, and enhancing the quality and credibility of this study. This methodology section explains the selection of the cases and the themes that create a framework for data collection, analysis, and reporting in Chapters 5, 6, and 7.

**Chapter 4 – Case Studies of Healthy Residential Developments**

Chapter 4 introduces the two cases: the Ecocase in Nadal (pseudonyms), California, which is a non-profit housing development created for low-income individuals disabled by MCS, and the Greencase in South Morris (pseudonyms), Florida, which is a private motel for individuals with MCS and which split into two separate businesses during the course of this study. A concluding table summarizes and compares features of the healthy residential developments.

**Chapter 5 – Factors of Formation**

Chapter 5 presents empirical data and narratives about the two cases in the study. These narratives explore the properties and dimensions of each theme within the context

of each case. Chapter 5 treats the investigation of how and why healthy residential developments were formed, and the factors that promoted or impeded their creation.

**Chapter 6 – Factors of Continuation**

Like Chapter 5, Chapter 6 presents the empirical data and narratives about the two case studies, the investigation of how and why healthy residential developments are continued, and the factors that promoted or impeded their implementation.

**Chapter 7 – Case Analysis and Findings**

This chapter presents analysis for each of the factors of formation and continuation, comparing and contrasting the case studies. A final section examines implementation methods.

**Chapter 8 – Conclusions and Recommendations**

A summary from the analysis emphasizes key findings, lessons, and implications from the analysis of healthy residential developments. It also identifies areas for future research.

# CHAPTER 2: THE NEED FOR HEALTHY RESIDENTIAL DEVELOPMENTS

## Introduction

The primary goal of this chapter is to examine the need for healthy residential developments, especially for people with MCS, and the role of planning and policy. This chapter uses the language of "safe" and "unsafe," which originates from individuals with MCS, whose functionality is largely dependent on their environment. A "safe place," then, is a home or residential development where someone with MCS can function and survive. It is consistent with the use of this term in the literature.

The first section examines how everyday exposures can cause illness and affect public health, not only those who may be especially sensitive. The second section explains why individuals with MCS need healthy residential developments, and why broader planning approaches are needed. A review of the literature, including prior work by the author, reveals the impacts of unsafe housing for individuals with MCS. The third section investigates how planners can create approaches to address the problems identified in the previous sections.

## How Pollutant Exposures Affect Human Health

### Everyday Toxic Exposures in Housing, Residential Developments, and Communities

Housing can be unsafe for many reasons, such as lack of seismic upgrades. It is also unsafe when occupants are exposed to potentially toxic pollutants, such as from consumer products and building materials. Primary sources include the following: pesticides, solvents, fragrances and fragranced products, cleaning supplies, paints, dry

cleaning, personal care products, chlorinated water, exhaust, manufactured wood products, carpets and carpet glue, new furnishings, candles, incense, air fresheners, deodorizers, exhaust, fabric softeners, varnishes, cigarette smoke, home renovation materials, and combustion appliances (Ott and Roberts 1998; Ashford and Miller 1998; Steinemann 2004).

A multitude of peer-reviewed, epidemiological studies link many health problems to everyday toxic exposures. Exposures can cause both acute and chronic effects, and both documented and unexpected effects. Not everyone reacts the same way to the same exposure. Plus, a health effect could also be masked by another exposure. Some health effects can be intergenerational, causing, for example, a birth defect in offspring of a person exposed to chemicals today (CDC 2005). As the links between pollutant exposures and potential health effects become better understood, more people acknowledge that reducing everyday exposures can contribute significantly toward creating a healthier society (Schettler 2002; Mendall et al. 2002).

Illnesses that are occurring with increasing rates and that are linked to toxic exposures include the following: hypospadias (a birth defect), breast milk contamination, Parkinson's disease, Alzheimer's disease, asthma in children under five, chronic fatigue syndrome, congenital heart disease, fibromyalgia, low sperm counts, endometriosis, migraines, allergies, lupus, diabetes, cancers, and developmental disabilities (such as deafness, behavioral problems, autism, and attention deficit disorder) (Ott and Roberts 1998; Baskin et al. 2001; National Cancer Institute 2002; Paulozi 1999; Swan et al. 1997; Schettler 2001; Schettler et al. 2000; Schettler et al. 2002; Boyle et al. 1994; National Research Council 2000; Pronczuk et al. 2002; Ashford and Miller 1998).

**Sensitivity to Everyday Toxic Exposures**

The EPA estimates that more than 50% of all illness is related to indoor air pollution (EPA 1989a; EPA 1989b). Although pollution can make anyone sick, certain groups of vulnerable people are at greater risk because they are especially sensitive to pollutants. In particular, approximately 11%-12% of Americans—about 35 million people—have developed MCS (Caress and Steinemann 2004). People with MCS suffer adverse effects from pollutant exposures at levels that other people may not even notice, such as at the parts per billion or parts per trillion level. Effects range from mild to disabling, and include the following: headaches, dizziness, cognitive difficulties, breathing difficulties, asthma attacks, lethargy, fever, flu-like feeling, sore throat, congestion, watering eyes, joint pain, muscle aches, rashes, allergic reactions, gastrointestinal problems, immune system disorders, seizures, and loss of consciousness (Ashford and Miller 1998; McCormick 2001; Caress and Steinemann 2009).

MCS has overlaps with sick building syndrome, Gulf War Syndrome, environmental illness, and asthma (Caress and Steinemann 2009). Some prevalence studies suggest that as many as one-third of all Americans have MCS and that this number is increasing (Kreutzer et al. 1999). An estimated 5%-7% of the American population has severe, disabling symptoms (Ashford and Miller 1998).

MCS is initiated by acute and chronic toxic exposures, such as to pesticides, solvents, and petrochemicals. People with MCS must avoid toxic exposures to prevent illness. Upon exposure, a sensitive person's symptoms may be immediate or delayed, and some symptoms do not disappear between exposures. There is no cure, though

people search desperately for treatment, often becoming destitute in the process of seeking safer housing and communities.

Toxic exposures, even low-level exposures, can cause severe disabling reactions for individuals who have been sensitized to chemicals. Yet everyone is sensitive to chemical exposures to some degree. Additionally, it is complex to try to establish the relationship between the dose at which a chemical is encountered and its health effects, because they can be delayed, cumulative, synergistic, addictive, masking, mutagenic, sensitizing, or intergenerational.

**Common Sources of Toxic Exposures in Housing**

This section examines common sources of toxic exposures in housing, followed by sections discussing the barriers to healthier housing, common sources of everyday toxic exposures outside the home, and barriers to safer, healthier places.

Conventional housing, such as single-family attached houses or multi-family apartments, may be unsafe due to building materials, appliances, and furnishings. Buildings materials typically contain synthetic chemicals that are not listed on the products, are often untested for health effects, and are left unsealed such that they can offgas into living spaces for as long as the life of a building. For this reason alone, some buildings cannot be remodeled into healthier housing. Synthetic wood products, such as particleboard and plywood, used for wall paneling, are chemically treated and emit a variety of chemicals, such as formaldehyde. Drywall, certain types of insulation, conventional interior paints and finishes, and many types of wallpaper can encourage mold growth or emit toxic pollutants, especially those that contain pesticides or antifungal agents.

To be energy efficient, many new buildings have been constructed to be airtight. Unless they are designed with methods for indoor air ventilation or filtration, they usually trap indoor air pollutants inside homes, and thus increasingly concentrate pollutants in living spaces (Bower 2005). Conventional carpeting, carpet padding, and carpet adhesives outgas many toxins. Moreover, carpets also trap pollutants and are a continued source of high volumes of toxic dust, which harbors allergenic microorganisms, such as dust mites, and chemicals that may have been used in the house or brought into the house. Pesticides do not readily breakdown indoors and can persist in carpets for many years. DDT, for example, has been found in home carpets more than 30 years after it was banned for use in the United States (Colt 1998).

In addition to building materials and methods, indoor appliances and furnishings can be sources of toxic exposures. Combustion appliances, such as gas water heaters, gas kitchen ranges, oil furnaces, and woodstoves can emit carbon monoxide and other toxic gases and particulate matter into the air. Indoor furnishings, such as manufactured word products and upholstered furniture, can emit hazardous pollutants such as formaldehyde.

**Barriers to Safer, Healthy Housing**

Barriers to safer housing involve programmatic and economic factors involved in renting a private housing unit, using government subsidized housing such as public housing or Section 811 vouchers, or building a home of one's own. The Healthy House Coalition (2003) has compiled the following barriers to affordable housing for people who are sensitive to toxic exposures:

(1) For private rental, people have difficulty finding a place that is not polluted in some way or they may find an accessible place, but the rent is too high. Some people

want to share a house, particularly to reduce housing costs, but "it may be impossible because of individual differences in sensitivities. …It may be impossible to determine the suitability of a place because the current occupants have belongings, furniture, products, pets, etc. that interfere with an evaluation. Unsure whether the housing will work, the prospective tenant may ask for a trial period. Landlords usually require a lease without a trial period. The prospective tenant is forced to give up the unit or must risk getting stuck with a lease on an unlivable unit. If a landlord is willing to allow a trial period of a month or two, the tenant may be paying double rent (on two places) during the tryout period, making it unaffordable. Cleaning and maintenance products used between tenants are usually toxic or highly scented. An 'airing out' period, like the trial period, may be unaffordable. Toxic repairs or pesticide applications insisted on by the landlord may drive chemically sensitive tenants out or prevent them from moving in. The owner might refuse to allow modifications to make a unit suitable for the tenant, even though the tenant is willing to incur the expense" (Healthy House Coalition 2003).

(2) For government subsidized housing using Section 8 vouchers or public housing units, the "units that are accessible cost more than the allowable rent. Eligibility for a rent subsidy program expires when the Section 8 certificate holder cannot find housing within the allotted time. Housing units operated by the Housing Authorities are not accessible for chemically sensitive individuals" (Healthy House Coalition 2003).

(3) Community non-profit housing programs also present barriers. "Housing may be for low-income individuals, but not be designed and built to be accessible for chemically sensitive individuals. Eligibility requirements may not be applicable for sick

and disabled people, such as sweat equity, employment requirements, income eligibility, and family size" (Healthy House Coalition 2003).

(4) Home ownership is also difficult. Most chemically sensitive people who are on a disability income are not able to finance the purchase of a home. "Many less expensive homes or housing developments are in denser neighborhoods where the air quality is poor because housing units are so close together. After buying a home, the owner then cannot afford to make the necessary changes, such as installing a less toxic heating system, taking up carpets and installing tolerable flooring material. Many low-income loan programs require the home owner to live in the home immediately after purchase, but chemically sensitive people often have to "air out" a house for long periods before they can live in it. This is especially true if remodeling is done, even after using the least toxic materials. Some individuals cannot afford to pay a mortgage and rent elsewhere while waiting to occupy the home. The option of renting the house while waiting is risky because of possible contamination by a tenant" (Healthy House Coalition 2003).

(5) "The option of building a house may be unaffordable. A person with chemical sensitivity may need to live in an outlying area in order to escape exposures, but land may be too expensive in outlying areas. The cost of putting in utilities may be very high. Even with the best effort to select less-toxic building materials, it is a gamble if and when the owner may be able to occupy the housing after construction" (Healthy House Coalition 2003).

Many building techniques have been used to create and renovate healthier housing. Generally, these techniques are based on three principles: eliminate the use of

toxic building materials, separate toxic materials from living spaces to reduce exposures, and ventilate toxins to outside (Bower 1997). Sometimes, a fourth principle considers whether building materials adsorb toxic chemicals from living spaces, and a fifth principle relates to the likelihood of a material to harbor a growth, such as mold, which can emit toxic chemicals.

People with MCS are at a much higher risk for homelessness than the general population, as much as 20 times higher (Waschler 2002). This is because alternative types of shelter can generate toxic exposures for many of the same reasons as conventional housing. The use of pesticides in public parks and homeless shelters, as well as the use of strong cleaning products, are particular problems.

**Unsafe Housing in Unsafe Residential Developments**

People with MCS who are forced out of their unsafe homes often find that their backyards are also not safe due to pollutants in their residential developments. Many people search desperately for safe housing, trying out many types of shelter, and some end up in unconventional housing situations. Even for those who secure healthy housing, outdoor air pollution can contaminate a healthy home because indoor air and outdoor air quality are inevitably exchanged. Chemically sensitive people with relatively healthy houses report that they are housebound for this reason (Gibson 1996).

In apartments, the use of consumer products by other residents can make an MCS resident very sick, such as when the hallway is mopped with a fragranced or chlorinated cleansing agent or the sidewalk is washed down with a harsh solvent. A sensitive person can return home to their apartment and find that their housing unit is contaminated by a neighbor's pesticide spraying, cigarette or marijuana smoke, painting, renovations, air

fresheners, aromatherapy practice, or incense use. These experiences are exacerbated in buildings with central air.

Idling cars, lawn mowers, and lawn blowers create fumes that drift. Laundry detergents, stain removers, and fabric softeners contain many known toxins that worsen air quality. A neighbor's chlorinated swimming pool may be a strong source of toxic chloroform exposures. The whole neighborhood may be affected by pollutant emissions from one person's wood burning fireplace.

Landlords or neighbors may choose to use pesticides at any time—even if they have promised not to—and a renter or homeowner can be exposed without consent or prior notice. Pesticides used for termites can permanently contaminate a home, and neighboring homes, thus requiring a sensitive person to break a lease or rental agreement. Many property managers spray pesticides indoors for roaches or outdoors on the plants that are landscaped around properties, and a chemically sensitive person may unexpectedly find a barrier to entering their home. Moreover, a government authority may apply pesticides, such as to control mosquitoes or to eliminate weeds on roadsides or in electrical wire throughways.

Chemically sensitive people who try to camp at national or private campgrounds have some success, but they typically run into problems when other campers make fires or apply insect repellent or sunscreen upwind of them. To avoid these problems, chemically sensitive people have set up their camps far away from other campers or have slept in their cars, and they report harassment from bears and from strangers. Moreover, the experience of living without basic needs, such as housing, medical care, and public access, is isolating.

Susan Molloy, a disability advocate for people with chemical sensitivity and founder of the National Coalition for the Chemically Injured, said, "It terrifies and angers me that we still don't have safe campgrounds or places to stay for the hundreds of refugees who are on the road right now in the Southwest in search of safe air. Some of these folks are desperate. Some of them are going to live and die in their cars. It is impossible for this to go on without a voice, a loud voice" (McCormick 2001:99).

In the next section, a literature review describes the experiences of chemically sensitive individuals in finding safe housing and safe communities and their implications for environmental planning and public health.

## Vulnerable Populations: A Critical Need for Housing Among People with MCS

This section begins with a review of previous research on the impact of unsafe housing and unsafe communities on individuals with chemical sensitivities. This review includes a published survey that the researcher wrote and administered, as well as the results of an original study by the researcher that is unpublished.

### Previous Research on the Impact of Unsafe Housing

Five different surveys of people living with MCS have investigated the prevalence of house safety, housing and lifestyle changes, the history of homelessness, trouble finding safe housing, the relationship of safe housing to income, the relationship of homelessness to disability access, and housing preferences among people with MCS (Gibson et al. 1996; Davis et al. 1998; Waschler 2001; Waschler 2002; Caress and Steinemann 2003; Caress et al. 2002).

(1) The first study evaluated the effects of housing on a wide variety of outcome measures on a national sample of 289 self-selected people with MCS. Concerning the

key questions “Is your home environmentally safe?” 34% (n=94) said yes and 66% (n=186) said no. Among those who said that their house was unsafe, 37% said that their house was unsafe because of their neighbors’ activities, and 53% said it was unsafe due to the indoor air. 99% of the sample indicated they had to “take special precautions in their homes (such as furniture, drapes, carpets)” because of their sensitivities, and 64% said they would be interested in relocating to safe housing built for individuals with MCS (Davis et al. 1998).

(2) In a population-based random sample in the Atlanta, Georgia metropolitan area, 61.5% (n =142) of 199 people reporting chemical sensitivities took precautions at home to prevent toxic exposures. Of the 69 people interviewed in a follow-up study of those reporting chemical sensitivities, 13% (n=9) had moved from their homes because of their sensitivities, and most people had made major adjustments to their living environments to accommodate their sensitivities: 34.8% (n=24) reported that they removed carpeting or furniture from their home and 47.8% (n=33) stated that they installed air or water filtration systems. Additionally, 76.8% (n=53) had changed their cleaning and personal hygiene supplies, 15.9% (n=11) said they had switched from gas to all electric appliances, and 33.3% (n=23) reported making other changes to their residences, such as ventilation, insulation, dehumidification, and arranging one’s own extended absence while painting and other remodeling was done to the home (Caress and Steinemann 2003; Caress et al. 2002).

(3) In a national study of 305 people self-identified with MCS, 40.6% of respondents said that their home was “very safe” or “mostly safe,” 43.9% said it “should be better” and 15.5% said that it was “mostly unsafe” or “not at all safe.” Participants

reported spending a mean of $27,816 to redo their homes since becoming chemically sensitive. Moreover, 66% of participants reported living in highly unusual conditions at some point in their lives to avoid toxic exposures. These conditions included a horse trailer, living in cars, in RVs, in tents, and in one purified room in their houses (Gibson et al. 1996).

(4) Few studies have focused on the problem and causes of homelessness due to toxic exposures, and this one, conducted in 2000 by the Environmental Health Coalition of Western Massachusetts's Housing Committee (EHCWM) stands alone in this important focus (Waschler 2001; Waschler 2002). The "2000 Housing Survey of EHCWM Members with MCS" investigated the history of homelessness, safe housing characteristics, disability access, and housing preferences of people with MCS. Its study is representative of the membership of its organization who had MCS in 2000, but it is not generalizable to either western Massachusetts or the rest of the United States. Nevertheless, its results are highly suggestive of an extremely serious housing problem.

"Of the 49 people surveyed by the EHCWM, 10% to 20% were homeless at the time of the survey, and over half (59%, n=49) have been homeless at some point since becoming disabled by chemical sensitivity. Of those who have been homeless, 85% have had to stay with friends and family, 43% have lived in their cars, and one quarter have lived in tents. Some participants wrote in housing situations such as 'on the roof,' 'in the hallway,' 'shed,' and 'living in car and cabin on and off.' Many also indicated ongoing substandard conditions such as a 'camper with no water or sanitary facilities'" (Waschler 2002).

This study also reconfirmed the difficulties of finding safe housing: "73% (36 of 49) of respondents have had to live in a place that made them sick. 51% (25 of 49) have had landlords or other tenants unwilling to accommodate their needs for access. 47% (23 of 49) have had to spend more than they could afford to stay in safe housing. Only 55% (27 of 459) of our sample consider their current housing safe, while even fewer 27% consider their current housing permanent (12 of 44)" (Waschler 2001).

People living in safe housing were more likely to have a higher income. 75% of people living alone (18 of 24) had a gross income of $12,000 a year or less. 68% of people living with partners (13 of 19) had a gross income of over $24,000 a year (Waschler 2001). "Among those who consider their housing unsafe, the largest percentage, 62% (or 13 of 21) are in the lower income ranges, compared with those with the highest incomes (14%, or 3 of 21). Those with the lowest incomes also indicate greater housing instability and problems with landlords and other tenants not accommodating their access needs" (Waschler 2002).

"Because homeless shelters are not accessible to people with MCS, the problem often goes undetected by housing advocates, including those promoting disability access. 'I am furious that zero respondents have been able to stay in a homeless shelter, " says national disability activist Susan Molloy of Arizona. […She urged] concerned citizens to pressure public housing officials to address the crisis: 'they have administered our shame for decades while we strained to phrase our requests reasonably and begged. Too many friends I love have died with this disease because they didn't have safe shelter'" (Waschler 2002).

This study also reported on housing preferences. "Most respondents indicated they would consider moving within the area to housing built for people with MCS, 43% (21 of 49) would move to an apartment or condominium of people with MCS, while 73% (36 of 49) would move to a cluster of freestanding homes for people with MCS" (Waschler 2001).

(5) In the researcher's preliminary analysis of a national survey of 133 self-selected people with MCS, most participants reported that they would be able to afford to rent a one or two-bedroom house in a community built for people with MCS at the level of $500 per month or less, and a significant number also reported being able to afford $900 or more, but few could afford rent costing between $500 and $900 per month. This may be because many people with MCS are not able to find accessible employment. (This unpublished survey was conducted on behalf of a non-profit organization for individuals with MCS.)

These results may also reflect the results of the EHCWM's housing survey (item 4 above), which suggested that people with MCS have low incomes, especially those living alone and that lower income people live in less safe housing than people with higher incomes, and thus might want to move to a safer, healthy community. Moreover, people living with partners may have higher household incomes due to having a healthier partner who can access employment, and thus afford higher rent.

**Previous Research on the Impacts of Unsafe Communities**

People with MCS may not be able to access the public and private places that other people take for granted. Everyday toxic exposures limit their abilities to participate in public meetings, voting, children's school activities, school attendance, the workforce,

most kinds of shopping, health care visits, restaurant meals, street fairs and festivals, libraries, travel, and religious activities.

In one study, 95% of a national, non-random sample of 289 self-identified people with chemical sensitivities experienced trouble shopping in stores or eating in restaurants (Davis et al. 1998). In a population-based random sample in the Atlanta, Georgia metropolitan area, 29.9% of 199 chemically sensitive individuals reported that it was difficult to shop in stores because of their sensitivities, and 13.5% reported losing their jobs because their sensitivities prevented them from functioning adequately in their workplace. Those who lost their jobs due to the chemical sensitivities represent 1.8% of the original random sample of 1,582 Atlanta area residents (Caress and Steinemann 2003). In conducting this study, one woman explained that she quit her job in a bank because it was located in a sick building with expensive renovations that caused her to acquire MCS, including new carpeting, new furnishings, new paint, and pesticide spraying in a place with no windows, no air ventilation, and no air filtration.

In a national, non-random survey with 305 chemically sensitive participants (Gibson et al. 1996), 7% of people were ill from walks outside or near their homes, 8% were totally housebound, 11% could not go to churches, 25% to malls, 8% to movies, 19% to restaurants, and 23% could go to restaurants rarely and with extreme care. 50% reported that they could not go to public areas where people might be wearing perfume, and many were unable to have visitors who wore perfume. Additionally, 24% reported that they had lost access to continued education, 33% lost involvement in hobbies, 22% lost their ability to travel, 22% could not socialize, and 9% could no longer visit family. Less than a third of the 305 original participants reported working outside of the home,

and only 22 (or 7%) were currently working in conditions that they considered safe for their health.

In a follow-up study with 268 participants, 75.5% (n=205) reported having lost their jobs or having had to quit because they were unable to tolerate the chemicals in their work environment. "Co-workers were often not receptive to requests to discontinue fragrances or other personal care products that were a source of difficulty for the workers with chemical sensitivities" (Gibson et al. 1996:7).

One mother said, "I don't participate in school functions much now because I get terribly sick in schools" (McCormick 2001:68). One woman interviewed said that she cannot go to the bathroom in public places because of air fresheners, and when she organized to get "unscented" products in her workplace, some of them actually had masking fragrances to cover up the real scents, and these products contained highly toxic chemicals that were worse than what were used before. To truly accommodate people with chemical sensitivities, communities would need to adopt safer, less toxic practices.

**Impacts of Exposures for People with MCS**

The impacts of exposures for people with MCS are adverse and numerous. Many people with MCS are unable to avoid toxic exposures, and they become sicker and disabled. People with MCS often lose their jobs, and, sadly, some lose the support of their families who do not understand their medical condition. Among people with disabilities, some people with MCS have felt marginalized because most services or agencies do not have programs for people with MCS. Appropriate medical treatment is generally not available because few doctors are trained to diagnose, much less treat,

MCS; and, most medical facilities are not accessible to people with MCS because of the toxic chemical cleaners used as disinfectants and the perfumes worn by staff.

People with MCS are usually not able to survive in a conventional home or apartment. They may react suddenly to toxic exposures as they try to enter, or they may become increasingly sicker as they stay inside. Sensitive people can find themselves alienated from their own homes. If pesticides are sprayed, for example, they may find that their possessions are permanently, irreversibly contaminated, and they may have to get rid of everything they own.

People with MCS who are homeless or at risk for becoming homeless due to toxic exposures must live in housing "situations" that other people may think are unusual. For example, a chemically sensitive family can own a house, but be considered homeless if that house is unsafe for them to occupy, even if they are partially successful in living out of their car. Thus, the concept of homelessness can be redefined to account for unsafe conditions created by toxic exposures. It is not a home if you cannot live in it.

Some people are able to make one room of their home somewhat safe, and stay in that room, which is often the bathroom because the ceramic tile is relatively safe, and there are no appliances. Some people are able to live in their backyards or carports, but many cannot even do this because their neighbors' activities make them sick.

For people with MCS, the lack of safe housing can result in the loss of jobs, the loss of family, and the loss of ability to function in society. It is creating an epidemic of homelessness, debt, disenfranchisement, and disability with potentially significant economic consequences. (Johnson 2000; Zwillinger 1998a; Zwillinger 1998b; McCormick 2001; Waschler 2001; Waschler 2002; Ashford and Miller 1998:26).

**Implications for Healthy Residential Developments**

The effects of everyday exposures on the ability of people with chemical sensitivities to find safe places to live has important implications for healthy residential developments. First, people with MCS can identify sources of toxic pollutants that would be important to reduce or eliminate. People who do not have MCS may be unaware of their personal exposures and possible health effects. This is not surprising because the labeling of many consumer products is not required or is inadequate (Ashford and Miller 1998; Steinemann 2004). Often, people who are sick may not know the cause, and they or their doctors may attribute sickness to the wrong cause. For example, a person who gets a headache may ascribe it to the weather and take aspirin to get rid of the pain, never thinking about their exposures to chemicals that outgas from, say, a new carpet at home. However, people with chemical sensitivities often do know what is making them sick, and that knowledge can inform healthy residential developments.

Second, people with MCS require healthy residential developments to participate in society. MCS is a devastating illness that is not confined to an insignificant number of people. The magnitude of the problem is enormous, and it has been called "bigger than AIDS." Dr. Ann McCampbell, M.D., said that suggesting that MCS does not exist "is like saying that the Holocaust never happened" (McCormick 2001). Safer, healthier homes and residential developments are desperately needed.

Third, healthy homes and healthy residential developments can reduce toxic exposures for everyone. This, in turn, could help reduce and eliminate the common exposures associated with the initiation and triggering of MCS.

## The Role of Planning

The changes needed to improve housing, residential developments, and disability access can be addressed by planners and policymakers who are in a unique position to promote residence-based and community-based approaches.

### Recognition of MCS

HUD recognizes MCS and has attempted to address the housing needs of people who suffer from this illness. MCS is recognized under the ADA, and thus requires "reasonable accommodation." MCS is also recognized by the National Academy of Sciences, the Department of Veteran's Affairs, the Department of Education, the Social Security Administration, and the Equal Opportunity Employment Commission. Moreover, a pre-decisional federal interagency report on MCS (1998), representing eight federal agencies, calls for more data on MCS prevention and disability related to MCS.

From an ethical perspective, three overarching principles are relevant. First, the precautionary principle says that we should take action to prevent harm to human health and the environment even when there is some uncertainty about the causes and effects of that action (Schettler et al. 2002). Second, the principle of informed consent requires decision-makers to allow human subjects to decide for themselves whether they want to be part of a public health experiment. This point has been made emphatically by opponents of municipal pesticide spraying for mosquito control, particularly due to concerns about the effects of pesticides on human health, which may be unknown and unmonitored. Third, widespread exposures to persistent toxic pollutants are considered a violation because it affects the basic ability of reproduction, and of women to gestate and breastfeed their babies (Schettler et al. 2000a; Schettler et al. 2000b; Steingraber 2003).

**Healthy Residential Developments and Related Concepts**

Before selecting healthy residential developments formed for people with MCS, an extensive literature review surfaced various types of urban, rural, and intentional communities. They included eco-communities and eco-cities, sustainable communities and sustainable cities, and healthy cities. These communities were conceptually different from a healthy residential development and community for two main reasons.

First, many of these other communities allowed practices that increased human exposures to pollutants and chose to prioritize other goals over human exposures reduction. For example, "eco-communities," "eco-villages, and "eco-cities" have advised the use of recycled products, yet these products may generate more pollutants than a conventional product. "Walkable communities" and "transit-oriented communities" (Calthorpe 1993) have recommended walking or bicycling to work, but this could prove problematic for sensitive people when outdoor air pollutant levels are high. "Green communities" and "energy-efficient" communities support a transition to biofuels, yet the burning of biofuels can contribute more to ozone-related mortality, hospitalization, and asthma than conventional fuels (Jacobson 2007).

Second, although several intentional communities were reducing people's toxic exposures to some degree, they were self-sufficient economies and were relatively independent of cities and counties.

The compatibility of these various concepts has been championed by advocates for sustainable communities by all these names (Roseland and Mitchell 2005). The healthy residential developments concept introduced here can provide a complement to these communities by focusing on the reduction of human exposures to pollutants.

## Conclusions

Sources of pollutants are common in housing and in communities. Pollutant exposures can affect everyone's health to some degree, but some groups are especially sensitive, such as individuals with MCS. These individuals represent an extreme case of the need for healthy housing and healthy residential developments because they require them to participate in society, including to access housing, employment, and most services. MCS is a devastating and debilitating illness that can be accommodated by reducing everyday toxic exposures in housing and communities. Because of their unique awareness, chemically sensitive individuals can help to identify critical toxic exposures that would be important to reduce or eliminate. Planners are in a unique position to address the need for broad-based, residence-level and community-level approaches to address the problems of unsafe housing. Federal laws, reports, and ethical concerns about toxic exposures provide a call for planners, particularly the ADA that requires reasonable accommodation for individuals with a disability, the Precautionary Principle in preventing potentially harmful exposures, and the right to informed consent for exposures.

# CHAPTER 3: RESEARCH APPROACH AND METHODOLOGY

This chapter presents the systematic approach and detailed methodology used for data collection, analysis, reporting, and analytic quality, primarily as they pertain to explaining how and why healthy residential developments form and continue, using a case study approach.

## Key Terms and Ideas

The following terms appear in the explanation of the methodology.

* The *case study method* or the *case study approach* is the process for qualitative analysis that includes data collection, analysis, and reporting of a case.

* The *healthy residential development* is a property that aims to reduce pollutant exposures to the extent required by vulnerable populations; for this research, residents with MCS.

* The *case* is the healthy residential development formed to meet the needs of individuals with MCS.

* *Critical toxic exposures* were pollutant exposures that impaired the health or functionality of those with MCS, and determined by those with MCS.

* *Case selection* is the choice in which specific sampling methods identify the cases for study among the population of potential cases.

* *Themes* are key issues or topics of analysis that derive primarily from the research objective, specifically *factors* of formation and continuation of healthy residential developments.

* *Coding* is an activity in data organization and analysis in which passages of data in text form are assigned a label, or code, to designate their content, particularly to show that a passage illustrates a *theme* or underlying issue.

* A *finding* is a context-sensitive observation about a case, or an analysis of the cases.

* A *lesson learned* uses extrapolation and synthesis to provide an evidence-based insight.

## Case Study Rationale and Selection

### The Case Study Method

This research uses a case study design to examine a phenomenon (Creswell 1998:37)—the planning and implementation of healthy residential developments. According to Yin (1994:9), a case study is used when "a 'how' or 'why' question is being asked about a contemporary set of events over which the investigator has little or no control." In this study, the primary research question asks: how and why do healthy residential developments form and continue?

The researcher used multiple sources of information in data collection to provide a detailed picture of each healthy residential development. Effort was made to describe the context or setting for the cases and to situate the cases within national policies, local planning regulations, and the immediate environs of each healthy residential development. The researcher took care to accurately report facts about the cases, and used various methods to verify them, such as asking follow-up questions and having various actors in the stories read the narratives and offer corrections.

This case study research was informed by ideas presented in Stake (1995) and Ragin and Becker (1992), and Flyvbjerg (2006). The information presented for these case studies is intended to create context-dependent knowledge that could be more valuable than predictive theories, to be generalizable "on the basis of a single case" as "a force of example," to generate hypotheses, test theories, and build theories about a phenomenon that would not be present in a large, random sample, to employ a learning process that is biased toward the falsification of preconceived notions, and to create good narratives about the cases (Flyvbjerg 2006: 224-241). These case studies illustrate "a particular phenomenon that is best understood narratively," and the stories "contribute to the cumulative development of knowledge" (Flyvbjerg 2006:240-1).

## Case Selection

### Defining the Case and Selection Criteria

For this study, a case is a healthy residential development that aims to reduce pollutant exposures to the extent required by people with MCS. In addition to meeting this case definition, additional criteria were determined to be important for selection of a healthy residential development as a case for this research. First, the residential development was currently active. Second, it housed people with MCS, although not necessarily only people with MCS. Third, the development contained at least ten units or homes. Fourth, a planning or community-level approach was needed to reduce pollutant exposures for the development.

The Population of Potential Cases for Research

Between 1999-2003, 25 potential cases were found that potentially match this description of healthy residential developments. These were in or around the following cities: Snowflake, Arizona; Cedar Hills, Arizona; Dolan Springs, Nevada; Frazier Park, California; Sulfur Springs, Montana; Silver Springs, Minnesota; Deerfield Beach, Florida; Escalante, Utah; South Morris, Florida; Prescott, Arizona; Wimberly, Texas; Potrero, California; Thompson, Georgia; Taos, New Mexico; Asheville, North Carolina; Paulden, Arizona; an unknown city in Maryland; Tucson, Arizona; Guerneville, California; Portland, Oregon; Cedar Crest, New Mexico; Crestwood, Kentucky; Seagoville, Texas; Dallas, Texas; and Nadal, California.

During research into these places, the extent of the planning and practices of each place was confirmed. Many existed only in plans that had not resulted in funding, sites, buildings, or stable groups for a healthy residential development. Others may have started, but had to shut down after a few years. In the end, after thorough investigation, only two residential developments met the case selection criteria for this research.

Case Selection Procedure

The two cases available for case study appeared to have surmounted the barriers of formation and continuation. How and why were they able to do it when other healthy residential developments have not?

These cases also characterized critical cases, extreme cases, and paradigmatic cases. Critical cases affect the development of knowledge. If individuals with MCS are especially concerned with chemical exposure and they form communities to reduce their

exposure, then their communities will be critical cases to study. Extreme cases provide more information than a typical case or a random sample. The two chosen cases offered significantly more information about the phenomenon of healthy residential developments, and people with MCS are exceptionally sensitive to chemical exposures. Paradigmatic cases show basic characteristics of the phenomenon under study. No standard exists for healthy residential developments, and the chosen cases were exemplars to study. This sampling strategy is consistent with guidelines in Patton (2002), Flyvbjerg (2006), and Stake (1995).

The Two Cases Selected for this Study

Two healthy residential developments were selected for in-depth case study: the Ecocase in Nadal, California and the Greencase in South Morris, Florida. In addition to meeting the selection criteria, these two cases offered dimensions that would be rich for exploration, analysis, and implications: public and private influences, stability, access to data, long-term housing provision, size, reputation, diversity of income, severity of disability, common spaces for interpersonal effects, comparative attached housing designs, and intended replicability as prototypes.

Notably, this case study of two healthy residential developments evolved from two into three cases because the Greencase was divided and half of it was sold to become a separate healthy residential development, the Greencase Condos. Where relevant, data collection and analysis occurred separately for each.

## Data Collection, Reporting, and Analysis

### Themes: A Framework for Analysis

#### The Concept of Themes

The key methodological concept for this case study is to organize the data collection, analysis, and reporting to illuminate key issues, which derive from the research objective. This concept is called a *descriptive analytic framework approach* (Patton 2002:438-40), and key issues or topics are called *themes*.

*Analytical themes* are key issues of analysis that derive primarily from the research objective. They are general *characteristics* of healthy residential developments, *factors* of formation and continuation of healthy residential developments, and *methods* for the implementation of exposure reductions. Many of these factors are common to most types of development, not just healthy residential developments. Most of them are deductive themes that were chosen *a priori*, and some are inductive themes that were added later as the data was analyzed.

#### The Origin of the Themes

During the design stage of this research, the themes for data collection and analysis were chosen based on three analytic goals that would guide the collection of information that the case studies were expected to provide. The themes were generated using inductive analysis of these objectives and additionally compared with standard texts, such as Peiser (1992), Griswold (2001), and Taylor (2002).

First, topics or categories that would fit within each of the objectives were compiled. Second, this list of potential themes was compared to the topics covered in

books about community development, intentional communities, eco-cities, and property management. Third, this list was reviewed by several researchers and organizations for individuals with MCS.

Finally, as data were collected and the analysis begun, the fitness of the themes was tested to judge if they needed adjustment to improve their ability to organize, report, and analyze the data. Most notably, several new themes for organizing data were created but all except one were merged into the original themes during analysis and reporting. For example, one new theme was created to discuss "early management" as a factor in the formation of the healthy residential developments because it was discovered that property management was also a factor of formation, not only a factor of continuation. Similarly, "funding" was found to be a factor of formation and continuation.

Themes by Category

The original themes that guided data collection and initial analysis are listed below in Table 1. The final themes used for analysis headline the next two chapters. No theme was dropped, though many were subsumed into other themes.

Below are the analytic goals for this case study research, along with their categories for analysis. The categories of these analytic themes are in italics. Codes were used for each factor to help sort and summarize the data and for the analysis of the themes and the subsequent reporting.

**Table 1: Factors for Analysis of the Cases**

| # | **Goals, Categories of Themes** |
|---|---|
| I. | To describe the history of healthy residential developments, their locations, and their residents. Descriptive characteristics:<br>1. Involvement (agencies, individuals)<br>2. Expertise (planners, architects, constructors)<br>3. Special advisement or training of "experts"<br>4. Vision (strong, weak, collaborative)<br>5. Funding for conceptual development and start-up costs<br>6. Choosing and evaluating materials (tolerability testing of materials for living spaces)<br>7. Design of community and the building interiors (layout of rooms, furnishings)<br>8. Local planning considerations, such as the permit process, building codes and zoning (facilitative or impeding)<br>9. Ownership and title (restrictive deed to reduce exposures, geological rights)<br>10. Ventilation system (functional, balance with filtration and separation)<br>11. Unique opportunities or challenges |
| II. | To investigate factors that affect their formation and continuation and that facilitate or impede healthy residential developments.<br>A. General Factors of Formation<br>1. Vision and Involvement<br>2. Funding<br>3. Ventilation<br>4. Outgassing<br>5. Early Management<br>6. Special Challenges During Formation<br>7. Factors of Formation Specific to Site Selection<br>B. General Factors of Continuation<br>1. Internal Governance Structures<br>2. Neighborhood Relations<br>3. Community Relations, Outreach Activities, and Publicity<br>4. Government Relations and Planning Issues<br>5. Funding for Operation, Maintenance, and Renovation<br>6. Factors of Continuation Specific to Property Management<br>a. Prospective Residents and Vacancies<br>b. Rules Governing Residents<br>c. Resident Relations<br>d. Residents' Abilities to Make Individual Adjustments to Units<br>e. The Selection of Property Managers Property and Building Maintenance<br>f. Property Management Decisions<br>g. Residents' Abilities to Make Individual Adjustments to Units |

**Table 1 continued**

| | |
|---|---|
| | h. The Selection of Property Managers Property and Building Maintenance<br>i. Property Management Decisions<br>j. Major Repair and Renovation Decisions |
| III. | To examine the implementation methods used to create healthy residential developments. |

The Selection of Themes

The first analytic goal was to collect primarily descriptive data about the setting of each healthy residential development and the people involved. The data collected under this objective are themes that characterize healthy residential developments, such as the year that planning started and the year the housing units were first occupied.

The second analytic goal has two categories: the factors affecting the formation of the community and the factors affecting its continuation. Special attention was given to the analysis of site selection for healthy residential developments, outlined as a subcategory, because characteristics of the location of the healthy housing can greatly affect its formation or continuation, such as potential nearby construction of a polluting industry.

The third analytic goal is to examine implementation methods at a healthy residential development to reduce the residents' exposure to critical toxic chemicals, and to implement the healthy residential developments themselves.

Themes Applied

The themes, taken together, form an analytic framework for approaching the data. The extent to which themes were added during fieldwork constitutes inductive analysis, in which new themes were discovered in the data. Narratives within each theme describe

critical incidents or major events or key issues that happened at the healthy residential development and that relate to the community's formation or continuation or methods. Within each analytic theme, deductive qualitative analysis was used to provide the results in the form of primary findings.

**Sources for Data Collection**

Data for the case studies of healthy residential developments includes in-person and telephone interviews, on-site observations and reflective notes, documents about the cases, such as websites, newspaper articles, other case studies of the Ecocase, and the use of the studies reported in Chapter 2. The purpose for gathering multiple sources of data is to cross-validate and triangulate the consistency of information to better understand when and why differences and gaps in the data occur and to contribute to the credibility of the research findings.

Interviews and Instrumentation

Interviews took place with current and former residents, board members, property managers, and visitors to the community, as well as members of the advocacy community for individuals with disabilities from MCS. All interviews were conducted by the researcher, who considered and followed multiple guidelines for conducting interviews, such as Patton (2002:339-428), who provides a detailed, 10-point "Ethical Issues Checklist," a "Sample of a Detailed Interview Guide," and "Tips for Tape-Recording Interviews."

An *interview guide approach* based on five protocols specified the wording of the interview questions with different types of participants. The five interview protocols guided interviews based on the type of interviewee, such as current and former residents

and managers at each healthy residential development and the board members of the Ecocase. These protocols follow the themes chosen for analysis. They also included key components: opening statements—including informed consent protocol—, research questions to be asked, and probes and prompts to follow key questions. The introductory scripts and protocols prepared for the interviews were guides, and this sequence and wording of most of the interview was decided in the course of the interviews.

The primary advantage of the interview guide approach is that it increased the comprehensiveness of the data, and each interview was tailored to the situation. The major weakness of the interview guide approach is that important topics and salient topics were inadvertently omitted. However, these could be identified and recovered in follow-up interviews.

The earliest work included 9 original in-depth interviews of individuals with MCS and 69 survey interviews—all by phone. This work is mentioned in Chapter 2. For the two case studies, there were twelve visits to the two sites. A total of 66 on-site and follow-up interviews were conducted with former, prospective, and current residents, former and current property managers, owners, visitors, sponsoring organizations' members, and advocates for individuals disabled by MCS.

Initially, about 10 interviews on-site at each location ranged from about 10 minutes to two hours in length. Most of the interviews were follow-up interviews conducted by phone, particularly with individuals instrumental in the formation and property management of each community. These interviews were typically 30 minutes to two hours or longer.

Site Observations of Healthy Residential Developments

On-site observations and reflective notes enhanced this case study because the case-study researcher sought to build rapport by meeting people face to face, and to create new understandings and deepen existing ones by seeing what the healthy residential developments looked like and experiencing what it was like to be on the properties, in their neighborhoods, and in surrounding areas. Field notes recorded observations and understandings and were summarized alongside the in-person interviews using methods adopted from various guidelines, most comprehensively Patton (2002:259-338).

The first visit to the Ecocase was in November 2003, and it was followed by numerous visits for meetings of the Ecocase Board, the Ecology Group (pseudonym), and private tours. The single visit to the Greencase Rentals and the Greencase Condos took place over several days in April 2005.

Original Interviews and Survey on the Critical Need for Healthy Residential Developments

Chapter 2 presented original analysis on the need for healthy residential developments. The data was formed from 9 in-depth telephone interviews with a self-selected population in the U.S. and over 60 interviews with individuals who reported sensitivities in a random sample in the Atlanta metropolitan area. The in-depth interviews asked individuals with MCS about the features of their houses and communities that made them safe or unsafe, what they would need to have a safe environment that would not make them sick, and what they have done to make their environments safer for them to live more comfortably. These interviews focused on the

etiology of MCS and what changes the individuals had to make to accommodate their illness (Caress et al. 2003). That study serves to increase the credibility of the case study data by providing analogies between the experiences of individuals in healthy residential developments with those not living in healthy residential developments.

Document Review, Expert Opinion and Assessment, and Audience Review

Documents about the cases added to the data. They included websites, newspaper articles, books, and reports about building design and materials. Notes from these were integrated into case summaries.

Contact with academics and organizations informed this case study. For example, one individual with a support organization for MCS operates a hotline and keeps a logbook to record the calls. In the month of May 2001, she received over 210 requests for assistance, of which 102 were requests for urgent housing needs or crises. Her descriptions of the types of calls she received informed the study. This case study research does not provide any identifying information about any caller.

Attendance, discussions, and presentations at conferences also informed the study. Those conferences were held, among others, by the Chemical Injury Information Network, National Centers for Independent Living, Bioneers, the Association of Collegiate Planning, the Association of European Schools of Planning, and the CDC (on public health and the environment). One workshop conducted by the researcher on healthy residential developments and accommodating individuals with MCS was particularly well attended by individuals with MCS and those trying to accommodate them in housing. In these situations, some of the interpretations of this study have been

tested. Also, some of the interpretations of this study have been tested on planners and property managers who are less familiar with the problems of individuals with MCS.

**Procedures for Data Collection, Recording, and Initial Analysis**

Using paper and pencil during the interviews, responses were recorded as *hand-written fieldnotes*, including *descriptive notes*, which recorded dialogue, and *reflective remarks*, which recorded empirical observations and analytical insights. To conduct follow-up interviews, the notes and the quotes from the interviews were used. During and after each interview, notes were written and *coded* using the *themes* and *emerging patterns* for later analysis. Also, memos were written that detailed ideas for emerging patterns and for additional paths to pursue that may have appeared as marginal remarks in the fieldnotes.

After each interview, a digitized summary of the interview was constructed based on the notes and memory of the researcher, using care to describe each participant's experiences and perspectives using his or her own words. For reflective remarks, the *convention* of putting text in brackets was used to distinguish the emerging or initial analysis from the descriptive data. Each digitized summary included memos. The original, handwritten fieldnotes were filed, and the digitized summaries were easily searchable for key words.

Throughout analysis, *memos* were written by hand into personal notebooks. Both the notebooks and the pages in them are dated and labeled. The fieldnotes, personal notebooks, and the digitized summaries were given distinctive page numbers. Any idea in the digitized summary can be referenced to the handwritten fieldnotes. Notably, after the digital summaries were complete, later memos in the personal notebooks were often

not digitized in a complete form. Nonetheless, working codes in the margins and headers designated the content for reporting and the source of the data in digitized summaries of the interviews or documents. Additionally, some of these memos found digital form in the case records used for analysis and interpretation.

Preparation for Fieldwork and Decompression After Fieldwork

Before the interviews with people involved in healthy residential developments began, several practice interviews were conducted at an intentional environmental community that was focused almost exclusively on housing. This practice interview served as a pretest for the researcher's interview skills, the intended interview questions, data recording techniques, and tools for initial analysis.

After several interviews were completed, some examples of digitized summaries with their remarks, codes, and memos for review were submitted to colleagues for the purpose of improving the recording and analysis. Data collection procedures accounted for issues frequently encountered in field research (Creswell 1998:128-130; Patton 2002:330-332, 380-384; Miles and Huberman 1994:69-76).

**Procedures for Data Analysis and Reporting Results**

Analysis occurred simultaneously and iteratively with data collection and reporting, building a set of *key findings* and crafting a synthesis of *lessons learned* formed into a set of principles and practices for healthy residential developments.

Initial analysis was concurrent throughout interviewing and site visits. It also occurred as *interview summaries* were created and *coded for themes and for emergent patterns*. During data collection, *interim case summaries* were produced. These summaries facilitated data collection through follow-up interviews.

As a part of this process, critical incidents and experiences of the healthy residential developments that were particularly powerful in their representation of factors of formation and continuation were identified, and several examples were selected as *vignettes* to develop collaboratively with participants in the study. None were written collaboratively because participants were not interested.

For each case, a *case record* was created that describes everything that is known about each case. These case records were written based on a synthesis of the data collected for each theme as well as emerging themes identified in the course of initial analysis and emergent patterns within those themes. These case records retained many references to the data sources in the summaries, such that any phrase or name or quote can easily be traced back to the interviews.

The final *narratives* are presented by theme. Themes organize the content according to descriptive characteristics of healthy residential developments. Chapter 4 is meant to describe and display facts about the cases and highlight their similarities and differences. In Chapters 5 and 6, the narratives are organized by the themes relating to factors of formation and continuation. The narratives are a premise, and the key findings logically follow from that premise. This metric was applied to shape the findings.

In addition to findings, critical interpretation matches themes with other themes. These *interpretative remarks* originate from the creative and pragmatic interplay of deductive and inductive and abductive processes of reasoning such that context-sensitive knowledge and facts provided in the case narratives drive expertise, then abduction supplies tentative hypotheses. Interpretative remarks are the analytic assertions of an

expert whose context-sensitive knowledge on a topic provides critical insights into the relationships within and between themes and cases.

The presentation of the results and the final analysis is in narrative form and in matrices with brief summaries. Five basic strategies are used for analysis: *categorical aggregation* to collect data from multiple instances from one or both cases within a theme, *direct interpretation* of individual instances of a theme, *pattern-finding* that recognizes relationships among themes, *matrices* to compare and contrast data within and across themes, and *naturalistic generalizations* to extrapolate from the case-specific findings to healthy residential developments more generally.

## The Quality of the Case Study

This research is applied qualitative research. Its orientation is primarily scholarly and secondarily intended for a wide and diverse audience. A list of the strategies used to enhance the analytic quality of the case study is provided. Then, criteria for the credibility and legitimacy of scientific research are discussed.

### Strategies Used to Enhance Analytic Quality

The following strategies were used to enhance analytic quality: use of verbatim quotes; assessment of alternative explanations and rival conclusions; design checks: reporting the limitations of sample alongside methods and results; use of triangulation protocols; member checks; prolonged engagement in the field; systematic use of systematic research methods; accurate description of data collection; information presented on the credibility of researcher; audience review; and ethical considerations. Objectivity of this study is of paramount importance, and every effort was made to

minimize bias by specifying strategies for preparation, fieldwork, analysis, and reporting to increase intellectual and methodological rigor.

This case study followed systematic procedures for fieldwork that are recommended by prominent case study methodologists, such as Yin (1994), Miles and Huberman (1994), Stake (1995), Patton (2002), Creswell (2003), and, Flyvbjerg (2006). As one example, multiple rounds of interviews were conducted with the same participants, and additional participants were asked the same questions as the original participants to determine if they saw the same thing in the same way. In fact, most of the interviews were follow-up interviews, and substantial data was repetitive. Most of the data presented in the narratives were collected multiple times from different people or from the same individuals, sometimes years apart. It was cross-checked and cross-validated during fieldwork.

**Triangulation**

Triangulation shows both consistency and multiple perspectives in the data and findings across multiple methods of data collection about multiple data sources, which are the cases. This research performed triangulation in several ways.

First, as discussed earlier, data source triangulation improved the validity of the data by comparing observations, interviews, documents, and participants' perspectives. Second, analytical triangulation occurs when other people review the study and do independent analysis. Third, theory or perspective triangulation occurs when alternative theoretical viewpoints cast their own shadows on the findings and interpretations, and their overlaps are areas of agreement, confirmed by triangulation. Fourth, methodological triangulation confirmed data description and interpretation by using

multiple methods to collect data. Fifth, reflexive triangulation involves connecting the researcher's perspective to reactions of the intended audience.

**Reliability and Reflexivity**

When multiple coders examine the data to assign codes, research reports intercoder consistency measures to show the validity and reliability of pattern and theme analysis. In this case study, the researcher was the only coder examining the data. After the data was coded, new emergent themes were created to group the data by theme, and later narratives to other themes were merged and subsumed into themes that could be analyzed more concisely.

One example of this coding process has to do with the topic of filling vacant units, which has two aspects: the person who fills the unit and with the unit to be filled. Early in coding, a new general factor of continuation called Advertising was added, which was expected to be a temporary theme. Later, in wondering how to code the topic of cleaning between units, it was coded it with the existing theme of Property Management Maintenance, which was intended for routine repairs. An existing theme was the first factor in property management called Resident Selection and Advisement. As narratives and interpretations of advertising were written, it was convenient to discuss other aspects of vacancies, including cleaning between units, selecting residents, and advising new residents. When the data for those topics either aligned nicely or differed dramatically between cases, it was realized that these themes could merge. The topic of cleaning between units was tied to getting new tenants into a vacant unit more than it was tied to concerns about the routine maintenance of the buildings. Thus, the theme was retitled,

Prospective Tenants and Vacancies. This example shows how the data were allowed to drive the subcategories for the theme.

**Generalizability, Particularity, and Lessons Learned**

Conventional generalizations in quantitative studies rely on statistical samples to represent a population in all its variation. In a case study, context-independent generalizations employ information-rich samples to create expertise so that another person can cognitively recognize comparable cases. Additionally, many qualitative researchers use the concepts of transferability and fittingness to compare the particular contexts intended for generalization. For some researchers, the term extrapolation can be substituted for naturalistic generalization as a way of describing a context-free assertion or working hypothesis based on the particularization of a case.

The point of particularization is not only to understand particular parts, which tend toward ephemera, but also to comprehend the whole of a phenomenon and thus to be able to recognize it in other contexts. Descriptive narration and analytical interpretation capture this process of coming to understand the whole of a context-sensitive phenomenon.

Lessons learned represent insights that analytically synthesize the findings about the cases. A lesson learned arises out of empirical observations of the narratives and findings. The lessons learned in this study reveal why each case formed and continued. They also show how the factors of formation and continuation interact within the particulars of the case as a whole phenomenon.

The purpose of lessons learned is to create practical knowledge that can implement solid, effective, applied projects to reduce critical toxic exposures in healthy

residential developments. The lessons learned are meant to connect the individual cases to the larger public issues around problems of exposure and projects intended to manage exposure. A *high-quality lesson learned* is an evidence-based insight that someone can apply to manage critical toxic exposures at the residential level or the community level.

**Ethical Considerations**

The research design and approach were guided by an ethical issues checklist and extensive discussion in addition to guidelines for fieldwork strategies and observation methods. Because a number of the participants were disabled with MCS, care was taken to accommodate their health statuses. Once the interviews were scheduled, the researcher offered to reschedule them "for any reason." People were also asked if they could tolerate the researcher and the location. The researcher brought along a change of clothes, and offered to change clothes or shower or change other conditions of the interview.

As part of the Institutional Review Board (IRB) submission process, a script was written to introduce the researcher to participants. Individual participants also signed informed consent forms that were reviewed by the coordinator of the IRB at Georgia Tech and several individuals who conduct or work with social science research on individuals with MCS. The locations and names of the two case studies, as well as all of the interviewees and some of the affiliated organizations were given pseudonyms to provide confidentiality.

# CHAPTER 4: CASE STUDIES OF TWO HEALTHY RESIDENTIAL DEVELOPMENTS

The first two sections of this chapter introduce the two cases of healthy residential developments that are studied in detail in the next chapters. The final section offers a table to compare the facts of each case. All proper names have been given pseudonyms to protect the confidentiality of individuals and places.

## Case Study Overview of the Ecocase

Built in 1993 and opened in October 1994, Ecocase is an apartment building for low-income people with disabling MCS. It was developed through the partnership of three local non-profit organizations that formed the non-profit organization, Ecocase, Inc., which owns Ecocase. Federal funds provided most of the funds for construction and later renovations, and continue to provide rental subsidies.

Ecocase has 11 housing units of approximately 540 square feet each. Its overall design takes advantage of sunlight and passive ventilation, made possible by its temperate and dry location that is approximately one-quarter mile from the Bay in Nadal, California in the Norcal metropolitan area. It is located in a dense residential neighborhood with other multifamily apartment buildings, most of which are newer construction. A one-mile circular walking path starts at Ecocase, passes by Dandelion Park Community Center and Library, and continues along the Bay.

Ecocase consists of three separate buildings joined by concrete walkways and situated around a central courtyard. The three separate buildings include a building for the electrical room and the trash room.

Five of the 11 units are on the ground floor, and the other 6 units are on a second-level, accessible by a staircase and an elevator, which is in a separate building from the residential units to isolate the noise and odors of the equipment. The residents share a laundry room, a community room, and an Airing Room, which was intended to provide space for residents to offgas their possessions. Notably, the Airing Room was turned into long-term storage space.

The use of each of these rooms and the behavior of the residents are described in a house rules document that all residents must agree to when they sign their lease. These rules include evictable offenses, such as wearing perfume or using a non-approved laundry product in the washing machines. However, no one has been evicted for not following these rules.

Apartment units are sealed to reduce potential exposures from their neighbors' units. The walls are made of gypsum and plywood. The gypsum wallboard was left unsealed to avoid the need to paint. The plywood wallboard was required by local zoning law. It was known to offgas formaldehyde; and, therefore, it was sealed with aluminum foil, which forms a vapor barrier.

The house rules prohibit the installation of shelving or the use of nails, which would puncture the wallboard. "The vapor barrier has been compromised in three units because people broke the rules," said one former property manager. Hanging things with thumbtacks is permitted; and, though the original house rules prohibited the use of tape, "Scotch tape" is permitted.

The units are bright and attractive. Large windows let in natural light to all of the units; some more than others. The units that get the least light are considered the least

desirable units by some of the current tenants. Each unit has a kitchen, a living room, a bedroom, and a bathroom. They have electric stoves, not gas, and powerful exhaust fans.

The units have baseboard heat, supplied by a gas-fired hot water boiler located in the other building and vented to the roof. The units have baked-on enamel paint on all the painted surfaces, such as the doors and doorframes, eaves, windowsills, cabinets, and shelving. The items were made of metal, and baked at 2,000 degrees Fahrenheit to force the paint to offgas. There were significant problems with both the tolerance of residents to these items at the time that they were installed and the flaking of paint over time. Many tenants asked to have these items removed. Many cabinets were removed, stored for a few years for outgassing, and then later reinstalled.

The units were originally supplied with expensive, imported, low-flow toilets. They failed quickly and could not be repaired with standard equipment. They were replaced with inexpensive, but satisfactory, low-flow toilets through the Ariel County Water Conservation Program.

The floors are comprised of unglazed tile with cement between the tiles. The cement is pure Portland cement with no petroleum additives. Without the additives, the granules come off the cement, creating a sandy layer that must be swept periodically.

The building has a whole house water filtration system that is partially carbon based. It also has a modular particulate filter that is replaced annually.

A second filter is located in a kitchen-like area of the community room, which most residents use for drinking water. It is a reverse osmosis filter, and the residents can use their own pitchers to collect water for personal use. This reverse osmosis filter requires twice a year service.

The buildings were designed with vents that open high above the buildings so that prevailing winds carry away exhaust air. Because the fans are so high, they also reduce electromagnetic exposures.

The building has two gas-fired boilers located in a separate building with gases venting to the roof. One boiler is for hot water in the buildings, and the other is for the baseboard heaters.

To reduce electromagnetic exposures, major appliances, such as refrigerators and electric stoves, are installed against outside walls rather than walls shared between units. The walls have extra shielding, and the wires are located behind the walls away from where they thought people would be in their rooms. The house rules do not allow microwave ovens, but some residents have them anyway and have thoughtfully placed them against walls that are not shared to reduce electromagnetic exposures to others. The electrical room is removed from the building.

The exterior insulation is made with Merco taping and a mudding compound. The foundation has a foam pad elevated above the ground so that water drains through an extensive drainage system to reduce the possibility of mold. The whole building sits on fill dirt. After a minor local earthquake, the property manager at the time had a structural engineer examine it, and there were no problems.

However, the gradual settling of the building, typical of any building in the Norcal Bay area, does cause problems because of the unique design of Ecocase. For example, the metal door and doorframes make it difficult to adjust the door closures as the building settles and throws the doors out of plumb.

Ecocase cost $1.8 million, which was 11% more than conventional HUD-funded buildings, or $8,000 extra per unit built (Ecocase and Kodama Associates 1997). This extra up-front cost was due mostly to three choices: the use of tiles instead of carpets for floor material (albeit, the tile generated savings over carpet in the long term), the choice of hydroponic baseboard heating, and the placement of a concrete parking lot instead of an asphalt one.

The landscaping does not include lawns. Initially, they used IPM and installed plants that were drought and pest resistant, as well as non-resinous and low pollen producing. Ecocase has a buried drip irrigation system, which was required by a local water conservation ordinance, and which also reduces chlorine exposure.

In order to qualify, the residents must be very low-income for this locality with a typical resident earning $9,000 or less per year. The market rate for the units is $725 per month. HUD provides rental assistance through a subsidy based on the difference between the HUD-approved operating costs of the project and the amount paid by the residents—approximately 30% of their adjusted income. Resident contributions range from about $80-$250 monthly per person. Many of the residents receive Supplemental Security Income for disability from the U.S. Social Security Administration. The requirement for moving in is that the resident is disabled with a doctor's certification.

Ecocase underwent several major changes since opening. The house rules were adopted in the second year after opening, and they govern the materials permitted by residents and the residents' responsibility for guests. Another change was a significant physical renovation. The unpainted walls were shedding small flakes, and all the residents were asked to leave while painting took place to seal the walls. The other major

changes at Ecocase have been in the management of the building, particularly changes in the membership of the board and the staff who supervise and manage the property.

The individual units and the building have a number of features that reduce the residents' exposures (Mahar 1999). Four major design parameters drove these features:

(1) What does it offgas? The materials and design of the building took into consideration chemical offgassing. For instance, because carpet and particleboard offgas dangerous chemicals, tile flooring was chosen instead of carpet, and particleboard was used minimally and sealed to prevent offgassing into residents' living spaces.

(2) What does it take to clean and maintain? For example, the exterior building walls are made of stucco with integral color. If the stucco flakes off, the color is already mixed into the plaster, and the wall does not need to be retouched with paint. Also, the Ecocase's tile floors are easier to clean than carpets would have been.

(3) What will it retain? Materials are chosen that do not adsorb airborne chemicals. Many types of plastic attract and bind chemicals from the air onto their surface, and then re-emit them.

(4) What grows in it? An effort was made to reduce the potential for the growth of mold, mildew, and bacteria. Strong vents in the bathrooms help reduce mold growth. The base of the foundation of the building is surrounded by foundation barrier made of Styrofoam insulation to reduce contact between the building and the dirt itself, thus reducing mold growth on the building.

These and other aspects of the design of the building and its building materials are described at length in a report published by Ecocase, Inc. in conjunction with the

architect, which is available publicly on their website (Ecocase, Inc. and Kodama Associates 1997) and in various book chapters (Rousseau and Wasley 1997).

### Case Study Overview of Greencase Rentals and Condos

Greencase Rentals opened in September 1998 in South Morris (pseudonym), Florida as a private motel serving people with chemical and electrical sensitivities. It opened with a total of 11 units for rent on a short or long-term basis. It was originally built as two standard motels, running parallel to each other and perpendicular to the Atlantic Ocean on one side and, on the other side, to the two-lane highway A1A, with a grass lawn in between. One building has four side-by-side attached, identical units, and the other building has five side-by-side attached, identical rental units plus a clubhouse, with two units, intended as a living area for the owner and guests. The attached units are separated by firewalls. The buildings are near a bluff overlooking the ocean. A deck with a staircase leads from the top of the bluff down to the ocean.

The motels were renovated with healthy housing principles and practices, such as tile floors, low VOC paints, organic bedding, and metal and glass furnishings. This renovation was done by the owner and manager of the Greencase Rentals, Amelia Conrad. She is chemically sensitive, and personally tested (on herself) and chose many products for use in the renovation.

Conrad put the Greencase up for sale in 2003. She now owns and manages only the half of the motel with four rental units. She sold the other half of the property to Thomas Martelli for $1,675,000 in September 2003. Martelli had 10 years of experience managing the Environmentally Friendly Housing Partnership, including units for tenants with MCS. Martelli had also been a renter at the Greencase for over five years. Conrad

related, “I wanted to maintain the integrity of the complex.” By selling to Martelli, Conrad knew that the units would be managed in a way that would reduce pollutant exposure for current and future residents. Martelli operates his half of the property under the name Greencase Condos, and he encourages the purchase of his rental units as condos.

The rental units on both sides are approximately 600 square feet in size. Each has a living room with a front door, a full kitchen with a back door, a bedroom with a closet, and a bathroom with a tub and a shower. There is an outgassing area in back of each unit.

The units each have a queen size bed with organic mattress, organic futon, organic cotton linens, an air purifier, a window air conditioner, and glass and metal, or solid wood furniture. There are ceramic tile floors and a full kitchen. At one point, TVs were supplied, and off-gassed before placed in the units. Martelli’s side of the property has a chlorine-free pool, which has remained closed since before the property was purchased.

Laundry facilities are available on-site, and they include coin-operated washers and dryers that restrict the laundry products used to baking soda only in one machine and specified detergents in the other machine.

Each side of the property maintains their own part of the lawn on their own terms, hiring the same people to do the work. Greencase Condos uses electric machinery for all yard work. Greencase Rentals uses gasoline-fueled machinery to trim the grass and trees, which causes exposures. Both places have separate water filtration systems that deliver chlorine-free water to all the units. Some long-term renters choose to bring their own

reverse osmosis, water filtration systems for their drinking water. Additionally, a local company delivers spring water to some residents.

Conrad rents her units for $590 per week, November through April, and $490 per week the rest of the year. Thomas rents his units for $945 per week, depending on the season. Discounts apply for monthly and long-term rentals. The maximum room occupancy is for 2 adults and 2 children under 16.

Conrad said that she has been successful renting the units and does not have more than one unit empty at a time. "A month or so" is a typical stay, though some people stay for 6 months or longer. At least two people have stayed longer than 5 years, and several people return seasonally. One long-term renter was a woman with MCS and her chemically sensitive son. When he avoids toxic exposures, she says his behavior is very normal. In addition, she attributes her improvement in health to staying at the Greencase.

## Summary of the Communities

Below, Table 2 displays the characteristics of the two case studies.

**Table 2: Characteristics of the Two Case Studies**

| Case Characteristics | Ecocase | Greencase |
|---|---|---|
| **Location** | Nadal, California | South Morris, Florida |
| **Year Built/Occupied** | October 1994 | September 1998 |
| **Ownership** | Private, non-profit | Private business |
| **Funding** | Rent, grants, rental subsidy | Rent and business investments |
| **No. of Units** | 11 | 11 |
| **Renters Since Opening** | Under 20 | Over 50 |
| **Market Rent** | $750/month | $590/week, $945/week (Rentals, Condos) |
| **Unit Size** | 540 square feet | 600 square feet |
| **Residents and Tenants** | Certified as very low income, mostly unemployed, certified with MCS by M.D. | Employed, dependent on employee, or retired; usually have some degree of MCS |
| **Neighborhood Density** | Moderate, urban residences | Low density, tourist motels |
| **Neighborhood Amenities** | Community center, library, waterfront path to Bay | Beachfront, bluff, nearby turtle refuge |
| **Building Design for Exposure Reductions** | Yes – From the ground up | Yes – As a renovation of two conventionally-built motels |
| **Building Air Filtration** | None | None |
| **Air Ventilation** | Exhaust fans, natural | Natural ventilation |
| **Water Source** | Municipal water | Well water |
| **Water Filtration** | Whole building | Whole building |
| **Air Conditioning** | None | A/C window units or central air |
| **Heat** | Gas-powered hydroponic baseboard heat | Radiators or central air |

# CHAPTER 5: FACTORS OF FORMATION FOR HEALTHY RESIDENTIAL DEVELOPMENTS

This chapter describes the formation of the two healthy residential developments through the examination of factors, or analytic themes. While many factors can influence formation, this research examines the primary ones, which include the following: vision and involvement; funding; design, materials selection, and construction; outgassing; early management; and site selection.

## Vision and Involvement

### Vision and Involvement for Ecocase

The founders of Ecocase were Bob Nettleton and Rachael Kirkman, both of whom worked for Ariel Homes for Independent Living (AHIL), which built housing for low-income people with disabilities. Nettleton and Kirkman believed that people with MCS had a right to safe housing, and that independent living centers could help them. Kirkman, a housing policy advocate for people with low incomes, was President of the Ecology Group (EGP), a non-profit organization that she formed for the primary goal of creating housing for people with MCS. One resident said, "The Ecocase would not have happened without Rachael Kirkman. It represents decades of work on her part; it represents her life's work. She got HUD to recognize MCS."

Ecocase received funding from HUD to build housing for people disabled by MCS. Among others, Kathy Rouseau, a national housing policy advocate for people with chemical sensitivities, had met with government officials in Washington, D.C., which influenced HUD's decision to recognize MCS as a disability. Another national advocate,

June Peavy, produced articles and videos about the effects of chemicals, particularly fragrances and pesticides, on human health, which also generated support for Ecocase.

Another force behind the formation of Ecocase was a successful housing project. In 1987, a non-profit housing board, which included Nettleton, had just completed a low-income housing development for people with mobility impairments. This housing board was interested in doing another project for people with special housing needs. In addition, it was intended as a prototype for a larger healthy residential development on adjacent land.

Bob Nettleton introduced the Ecocase project to the board. Among the options for a new project, he said, "[MCS] was the one that I felt was the biggest unfilled need." The members of the board agreed. Nettleton became the volunteer president of a new housing board for "Ecocase, Inc.," a group of volunteers to build housing for low-income people disabled by MCS. After forming "Ecocase, Inc.," the executive board hired Judy Lippard, a local housing consultant. Ecocase opened in October 1994.

**Vision and Involvement for Greencase**

Amelia Conrad began work in the Morris area on Greencase Rentals in 1997. In the beginning, Conrad had a vision of the Greencase as a place where people with MCS could regain their health, and engage in political activism to reduce chemical exposures. She anticipated that the community of residents at Greencase would generate local attention for their efforts, and bring awareness to the hazards of everyday pollutants. Conrad now realizes now that many residents with MCS are just trying to survive, one day at a time, and may not have the functionality to engage in activism.

In addition to a vision of activism, Conrad was driven to create the Greencase by a "selfless desire to help others," according to one long-term resident. "She did the Greencase at great personal expense, dedication, and exhaustion in order to give people with MCS a safe home. For many of us, she saved our lives."

## Funding

### Funding Ecocase

The new housing board asked Judy Lippard and Rachael Kirkman to search for funding. Their first application for funding was denied by HUD because AHIL, the only sponsor for Ecocase, was a small organization, and, by itself, was not considered sufficiently experienced with housing development. AHIL invited the joint sponsorship of the Metro Bay Housing, Inc. (MBH), a large non-profit corporation dedicated to the development of affordable housing in California and Hawai'i.

In 1989, with MBH support, Lippard and Kirkman applied for and received a $5,000 federal grant from the Community Development Block Grant (CDBG) program administered by Ariel County. They used this CDBG as seed money to develop a formal Section 811 program proposal to HUD. Their work included asking HUD to recognize MCS as a disabling illness, thus allowing Ecocase to rent exclusively to people disabled with MCS, as designated by specific criteria.

HUD's Section 811 program provides an interest-free capital advance for development. The building must remain in disability and very low-income use for forty years, after which time the debt is forgiven. HUD also provides rental subsidies, filling the gap between the amount that resident's pay (usually 30% of their adjusted income)

and HUD-approved operating costs for the project, which include a plan for providing supportive services.

Although HUD regulations require exclusive disability-use, they do not specify the type of disability for which the building must be occupied to retain Section 811 program funding. Board members could decide to revert the tenant policy from the exclusive use of individuals disabled with MCS to individuals with other types of disability.

Ultimately, Ecocase was designed and built using nine sources of funding that were provided by HUD's CDBG program, HUD's Section 811 program, HUD's HOME Investments Partnerships program, Ariel Community Foundation, Norcal Community Foundation, Metro Bay Housing, and Ariel County Housing Trust. CDBG and HOME Investments provided multiple awards. The CDBG seed money made it possible for the board to seek these other sources of funding. In later years, Ecocase's Board was able to seek and obtain additional CDBG funding to make repairs and renovations.

**Funding Greencase**

Greencase was purchased and renovated under the exclusive ownership and direction of Amelia Conrad. She invested her own money to get a conventional commercial mortgage. Conrad's ability and interest in spending her own money to start Greencase Rentals is, according to many residents, an uncommon and heroic investment by a single, purpose-driven individuaDesign, Materials Selection, and Construction

**Design, Materials Selection, and Construction at the Ecocase**

Ecocase chose an architect who had a solid record in affordable and special needs housing, and a contractor early in the building process so that their members could

participate in the design of the building. Working together, they met monthly for two years before construction began.

At the time, very few architects, designers, or builders were knowledgeable about building methods and materials to reduce pollutant exposures to the extent required by sensitive people. On the other hand, the architect and contractor did consult with people who had MCS. The board was able to recruit and pay some sensitive people to comment on the building design and test building materials for suitability. Some even slept with materials as a way to learn more about their suitability for the building.

The support for this project was high because people believed that the need for such housing was great. Many people volunteered to help; not only did chemically sensitive people sacrifice their own health to test materials, but housing professionals such as Lippard and Nettleton did much work pro bono.

During construction, residents were concerned about the lack of oversight. The designers chose special building products and ordered them, but suppliers, contractors, or other workers made substitutions for more familiar products. Further, the rationale for selecting the special products was not always made explicit. For example, years later, no one could explain why the existing toilets had been special ordered, but they couldn't be repaired and thus were replaced with less expensive, conventional toilets.

In the construction of Ecocase, at least one supplier provided inaccurate information about a building product. This product was thought to cause adverse health effects among the residents. The wallboards, or drywall, that were supposed to be 100% gypsum were actually made with a mixture of municipal solid-waste incinerator fly ash. However, the product label did not disclose this information. After moving in, some

residents reacted to the drywall that was flaking off the walls and generating dust particles upon all surfaces in the rooms. It was later determined that the drywall contained fly ash, which typically contains hazardous chemicals, and which was suspected as the source of the problem.

Ecocase was built with attached units, with exceptionally thick walls, rather than detached housing units. "Ecocase planners dreamed of a large site with appropriate zoning for small detached cottages." However, Bay Area land use restrictions and cost constraints precluded such a design.

The development was designed with 11 housing units. One reason for this number of units was a HUD requirement that low-income apartments with 17 or more units have a full-time, live-in property manager. To the board, the MCS safe housing units were precious, and they did not want to sacrifice one for an on-site manager who did not require an MCS unit.

**Design, Materials Selection, and Construction at Greencase**

In renovating Greencase, Conrad, who is also chemically sensitive, hired and oversaw a contractor. During the renovation, she and the workers had frequent meetings and reminders about using healthier, safer, least toxic methods and practices. Problems and miscommunications occurred, though. Conrad explained that the "worst thing" that happened was inside the main house. One of the workers sprayed a DEET-based insect repellent on himself while in a room in the house. Conrad became sick every time she entered the room. As she said, "They knew it was wrong. They apologized. For years, … I avoided that room. …It had long-term repercussions."

Conrad made many personal sacrifices to renovate the buildings: "I slept in a tent. … I was bitten by the no-see-ums." For building products: "I tried them on myself. I smelled everything. … I was the guinea pig for everything." Conrad tested materials on her own chemically sensitive body and got sick every day during the renovations: "I walked into walls." And, she fell down sometimes from dizziness and confusion, caused by exposures to the toxic building materials.

Conrad reflected on her development of the Greencase: "I had a tremendous amount of idealism. ….I was going to do it at all costs. The costs were very high. But, I powered my way through. I wouldn't power my way through things now. I used to expose myself for hours and months. …Man, I paid the price. I know that I won't do another place like this."

She selected materials that were considered least toxic. However, she regrets some of those selections now. One of the things she would have done differently is buy higher quality building materials. Conrad used products that "were better if you are sensitive." She found that some of these products "were worse for quality… they don't harden as well," and that some conventional and higher quality products may be relatively safe, once they offgas.

Greencase units were attached, rather than detached, on each side of the property. "It would be better to have them all individual houses," Conrad notes. But she believed the units worked well, nonetheless, because the walls were thick firewalls that went from the floor to roof.

## Outgassing

### Outgassing at Ecocase

"The building was so toxic in the beginning," one resident said. Other residents said: "I spent 3-4 weeks staying with friends," and "I slept with my head out of the door," and "For the first year or so, I kept my windows open continuously."

Because the building was brand new, the construction materials were still outgassing pollutants—pollutants that were making the residents sick. Nearly all of the original residents experienced adverse health effects from exposures to the new building materials during the first year and later years.

The need to outgas the building before occupancy was considered by the designers. However, HUD funding requirements meant that the building had to be occupied soon after construction was complete. One alternative was to have non-MCS disabled individuals live in the apartments during the outgassing period. But the Ecocase board wanted to make the units available to people with MCS as soon as possible; plus, they were concerned that non-MCS individuals may unwittingly contaminate the apartments.

### Outgassing at Greencase

At Greencase, outgassing was also a challenge. Conrad wanted time to allow materials and products to outgas, but she often did not have the luxury of that time, with current and incoming tenants, and the need to keep the units occupied for rental income. Even furnishings such as organic cotton beds were not immediately tolerable. "In the beginning, they smelled … They [the guests] would have to wrap the whole darn thing in

Denny Foil: the blankets, then barrier cloth … I always worried, with every new person that came here. …It took a long time… a couple of years before they [the mattresses] were all really outgassed. Then, they could be handled by everybody."

## Early Management

### Early Management at Ecocase

When Ecocase opened, the board members, who had worked together for years to plan and construct the Ecocase, managed it themselves. Nettleton, the first board president said, "We felt that no one else would understand [what we were trying to do.]" They formed a Resident Selection Committee led by Judy Lippard, and new tenants began to move in.

Prospective tenants were supposed to stay overnight before signing a lease agreement, and many did not. Lippard explained, "The desperation of the prospective tenants drove the development [of the situation in which tenants moved into Ecocase]. …The rules were not adhered to. …They were desperately sick. …People wanted it to work out so badly that they took the risk. …It worked out terribly for them."

For starters, there were problems with the building. According to several people, the three biggest problems were the wallboard flaking off and leaving toxic dust on the surfaces of the rooms, the odorous baked-on enamel paint on kitchen cabinets and trim, and the unexpected and high electromagnetic frequencies in apartments.

Ecocase was a small property with no on-site property manager, and members of the board were on an emergency list for responding to problems. They provided their personal home and cell phone numbers, and were receiving many calls from residents.

The first board meeting after occupancy was attended by the new, and unhappy, tenants. One resident said: "The composition of the board was all social workers, no one with [MCS], no healthy housing consultant…." Some residents said that the board members responded with, "Be grateful," and "Oh, you're too sensitive, you should move."

The board believed they could manage the property on its own, as the Ecocase had only 11 tenants. In theory, tenants would move in, settle down, and pay rent. Yet each of the problems encountered after the tenants occupied was substantial, and not easily solved. The board then decided they needed a professional property manager.

The first property manager, Rupert, was new to housing people with MCS. He was struggling not only to set up property management systems, but also to respond to the residents' unique and urgent housing needs.

"He was a nice guy who knew nothing about MCS. … Residents tried to tell him about various problems, but he just didn't know," said one interviewee. "It was too much of an expectation [for him to learn about less toxic principles and practices of management.]" For example, he came to work scented, having used products with fragrances in them. The residents tried to explain that these products were making them sick, but it was difficult for him to understand what to do.

**Early Management at Greencase**

Conrad was the owner and property manager at Greencase, and responsible for maintenance. When Conrad first opened Greencase, making repairs was difficult because she was concerned for the health of the incoming and current guests. If she could not make a repair safely in time for an arriving guest, or for current guests, then she did not

make the repair. As a result, she often needed to forego some repairs and improvements. For instance, she might not have been able to safely repair a small hole in the wall for aesthetics, whereas a regular motel could use spackling paste. So instead, she placed a framed picture over the hole.

Renter theft was also a management issue. During the early years that Conrad operated Greencase, she had multiple incidences of renters who stole property from her. In one case, she looked out the window to see a renter putting the organic mattress in a truck with a bunch of other furniture from the unit. When she tried to stop the renter, the renter explained that he needed the items more than she did.

## Site Selection

The site is critical to a healthy residential development. This section explores aspects of site selection that are important for reducing pollutant exposures.

### Sites: Density and Neighborhood Character

Low density is often desirable because nearby residences and businesses can be sources of exposure. Ecocase, however, was sited in a high-density area. Site selectors wanted a location in a much lower density area, but many of the areas zoned for multifamily housing were in dense areas that allowed more land uses, and thus had unacceptable local air quality. They tried to get a site in West Ariel County, which is hilly and less dense, but the county would not allow a multifamily development due to slow growth restrictions. Many otherwise good sites were land parcels that were not appropriately zoned or not in their price range.

At the time of construction, Ecocase was the only building on the block, and much less local development was expected than what occurred. Just after Ecocase was

completed, land values in the area increased, leading to unexpected new apartments on the street and more people, and consequently more exposures.

For Greencase, the owner was looking for a hotel to renovate, along the ocean, in an existing low-density area; after much searching, she found it. The hotel is on a section of Florida coastline that is sparsely populated, and adjacent to a two-lane highway; however, ocean breezes tend to blow traffic pollutants away from the hotel.

Both healthy residential developments were sited in areas without much development and ended up in areas with considerable construction due to increasing land values and housing and hotel demand.

**Sites: Elevation**

Even though both of the healthy residential developments are in low-lying areas, which have the potential to trap pollutants, they are near the ocean and receive relatively clean ocean breezes. Ecocase was designed to ventilate using the breezes off the Bay, but sometimes those are not enough. Residents noted that polluted air can get trapped inside the courtyard in the middle of the buildings. At Greencase, the winds are often very strong, and residents typically do not notice the highway pollutants. From these two cases, it seems that a low-lying area can be made to work as long as ventilation with good quality air is available.

**Sites: Nearby Industries**

At Ecocase, some residents reported exposures from several auto repair shops located less than a mile away, and from planned explosions less than one-half mile away from operation of a movie studio's special effects lab. The lab also receives deliveries from trucks that idle their engines, creating additional sources of local exposures.

At Greencase, most nearby businesses are also small motels. One source of exposure is a restaurant across the highway, operating a gas grill, whose fumes are noticeable when the wind changes direction.

**Sites: Nearby Construction**

While site selectors for Ecocase knew the area around them would be subject to future development, nobody expected so much, so soon. Residents reported chemical exposures from construction in the neighborhood. Construction-related exposures are not a long-term problem now that the area has been mostly developed, but the increased density has led to exposure from increased vehicular traffic and population, for instance.

Guests at Greencase did not report construction-related exposures despite work at a nearby hotel, though the increased traffic on the street due to the new hotel facilities down the highway could become a problem, according to Conrad.

**Sites: Previous Uses**

Site selectors at the two healthy residential developments looked for sites that did not have a previous use that could jeopardize the health of people with MCS. Ecocase was built in an area of land on the Bay that was shaped partly with fill, so some of the soil was brought from some other areas. Greencase had previously been a conventional motel. In both cases, the history of land use, to the extent known, did not rule out the sites.

**Sites: Setbacks and Parking Lots**

The design of Ecocase intentionally optimized its position on the lot by creating setbacks from the street and nearby high-tension wires. Some residents are more

comfortable than others with the distance between themselves and the parking lot, and several suggested that the distance should be a little bit farther.

The Greencase owner selected the site with concern for its setback from the street and high-tension wires. The parking area is at the far end of the property in a grassy area that is in a downwind direction from housing.

**Sites: Unique Requirements**

One challenge in siting Ecocase involved compliance with two funding-related HUD requirements: the need to locate Ecocase within one-half mile of a bus line, and the need to ensure adequate wheelchair safety from the doors of Ecocase to a bus. Site selectors tried unsuccessfully to get a waiver from HUD, arguing that people with MCS would not be able to ride a bus because of their disability (e.g., disabling exposures to people wearing fragranced products on the bus). They also pointed out that the buses in some areas only pass every few days. Nevertheless, for four years, they looked for potential sites. They were merely days away from losing their HUD funding when they purchased the site that became Ecocase.

**Sites: Zoning and Land Use**

For Ecocase, preferred sites in low-density areas were too expensive or had slow growth restrictions. Ecocase was built on a site that was within the authority of both exclusionary and inclusionary zoning ordinances. Under inclusionary zoning, a high-income housing development could be made more profitable if it was packaged with a low-income housing development. Ecocase site was not for sale, but the site selectors were able to buy it from a developer who was able to profit from the relationship. Rezoning was necessary to allow low-income, multifamily housing on the site.

The Greencase was already zoned for its intended use as a motel. In one instance, local authorities tried to shut down its renovation when they mistakenly believed it would be providing medical services, while not being zoned for hospital facilities or not having permits to provide medical services.

**Sites: Pesticides**

Pesticide applications, prior or current, can render a site unsuitable. At the Ecocase, pesticide spraying against the light brown apple moth was imminent, but temporarily averted by the efforts of environmental health advocates across the state and country. At the Greencase, pesticide spraying along nearby roads for mosquitoes had caused problems for residents. Conrad was able to broker an agreement with the County for advance notification of spraying, so that residents could close their windows and avoid those roads. Another concern was the termite tenting of the next-door neighbor's home, which forced some residents to leave the Greencase. Finally, Greencase is near a protected sea turtle nesting area, and Conrad was able to prevent pesticide spraying at Greencase due to its proximity to that area.

# CHAPTER 6: FACTORS OF CONTINUATION FOR HEALTHY RESIDENTIAL DEVELOPMENTS

This chapter investigates the two healthy residential developments and factors that influenced their continuation, including internal governance structures; neighborhood relations; community relations, outreach activities and publicity; government relations and planning issues; funding for operation, maintenance, and renovation; and property management.

## Internal Governance Structures

Internal governance structures determine how decisions are made within a healthy residential development, including the cohesiveness of policies and processes, the definition and implementation of powers and expectations, and the management of operations.

### Ecocase, Inc. and its Housing Board

Ecocase is an apartment complex privately owned by Ecocase, Inc., a non-profit organization that began with the official sponsorship of three organizations: MBH, Inc., AHIL, and the EGP. MBH, Inc. is a large, non-profit corporation that develops low-income housing, and manages over 8,000 housing units in over 80 properties. AHIL was a non-profit developer of housing for people with disabilities in Ariel County, and was taken over by Ascension Housing around 2001. Ascension Housing is one of the nation's largest providers of affordable housing for low-income individuals. It, in turn, is sponsored by the Sisters of Ascension, a Catholic non-profit corporation dedicated to

service to the poor. EGP is a non-profit organization that provides advocacy, support, and resources for individuals with MCS and related illnesses. EGP remains an active organization due to the steadfast leadership of a few core members. A housing board oversees the operations of Ecocase, Inc., and has nine members who are appointed by MBH and AHIL. EGP can nominate two of those members, who must be approved by the existing board.

The role of the board has changed over time. The original board oversaw the formation of Ecocase, sought and found sources of funding, hired a housing consultant, an architect, and a builder, and selected an appropriate site for building. They supervised construction, coordinated the selection of the original residents, and publicized their accomplishments. They dealt with various challenges in formation, including problems with the building, some of which were specific to building for people with MCS. Later boards were not as involved with residents or property management.

When the early board met, meetings were attended by four to six residents. Since then, the residents have stopped coming to the meetings. One resident said, "I don't think much of the board," to imply that the board was not attentive to needs of residents to reduce pollutant exposures. Some residents said that members of the current board do not understand MCS. One interviewee said, "The current board has only one member who understands MCS. The original board, *they* understood chemical sensitivity." Others said, "The original board had three or four people with MCS," and the current board "contains no M.D., no [MCS] builder, and no activists."

The EGP nominated Cynthia Smith, a local philanthropist, to be on the board. She has MCS and is a long time EGP member who holds positions on several committees

and councils in Ariel County. But her nomination was not accepted. According to one EGP member who was at the board meeting when she was nominated, "She was not treated graciously and with respect. … The board slapped her [metaphorically]." One board member denied that she had ever been nominated, but some residents and EGP members were upset that Smith had been rejected.

The EGP would like the board take a more activist stance, but some members of the board are interested in having "asset managers." The board is concerned with the financial health of Ecocase, and they want members who can help them with "the bottom line," said one board member. The board hired Ascension Services to take over property management at Ecocase, enabling them to focus more on fiduciary responsibilities and less on problems of property management, particularly resident relations.

"The difference between the first board and the later boards is amazing," said one interviewee. The original board had "so much passion and commitment. ...They were passionate and devoted. …They really cared. ...They [the members of the first board] were totally involved in all these projects." One interviewee described an original board member who left to become the head of the national disability rights group. This board member had gone into the attic with the property manager to help search for the source of a noise. "He was not a young man, and it was a difficult climb." The interviewee said that the original board members had "dedication," and used to have annual retreats to accomplish planning. It was at one such retreat that they wrote the mission statement for Ecocase.

The meetings were reduced from bimonthly to tri-monthly and from two hours in length to one-hour meetings. "The [current] board was more concerned about money

than the residents' well-being," said one interviewee. "The current board's attitude is: 'We want to see the books, and we don't want to hear the problems.'"

Ecocase co-founder Kirkman said that the last time she had attended a board meeting, she was "disgusted" by the board members' disparaging attitudes toward the residents and people with MCS in general.

The Residents' Council, which was intended to be a body to represent the residents' views to the board and plan activities, is now defunct. The original residents chose not to meet because they had conflicts stemming from differences in religious and political ideologies and personal habits. Notably, some of the roles of the Residents' Council are fulfilled by the EGP, such as planning activities for the MCS community that are held at Ecocase.

**Greencase Rentals and Greencase Condos**

Greencase is now operated as two separate businesses, located side by side. The Greencase Rentals is the original name for both, and it is a motel owned by Amelia Conrad. She sold the north half of the property to Thomas Martelli, who operates the Greencase Condos. This division of Greencase into two separate businesses has not dramatically changed governance because the individuals in charge, Conrad and Martelli, each have a similar commitment to housing people with MCS. Both are accomplished business people with experience.

Conrad and Martelli each have individuals who help them manage their respective properties. Additionally, both of them hire many of the same workers when they need on-site help with maintenance, repair, or construction.

Because they are sole managers, if their attitudes or attentions shift, the integrity of the community is at stake. For instance, feeling burned out from running Greencase, and wanting to move on with her life, Conrad put the property up for sale, selling part of it to Martelli with the understanding that he would run it as a MCS-safe property. Yet the deed to the property had no restrictive covenant in it requiring Martelli to maintain it with a concern for reducing pollutant exposures.

As a bottom line, Conrad and Martelli are each free to shut down their businesses at any time for any reason, such as for more profitable uses. Indeed, Conrad currently has Greencase Rentals for sale, and may choose to sell her part of the property to a buyer who does not have a similar commitment to reducing pollutant exposures. This, in turn, could affect Martellis's property to the north. Thus, Greencase's continuation relies on the continued and joint dedication of Conrad and Martelli to providing housing that is suitable for people with MCS.

## Neighborhood Relations

Neighborhood relations can significantly affect the continuation of a healthy residential development because the behaviors of neighbors can affect exposures both at the residential development and in other locations of the neighborhood.

### Ecocase Neighborhood Relations

At Ecocase, some residents were involved in the planning process and policies at Dandelion Park and Dandelion Center, about a mile away. Their on-going involvement led to a commitment, from Dandelion officials, that pesticides would not be used inside or outside the park area and center, thus making it accessible to Ecocase residents. As another example, a former property manager, Michael Frank, secured the cooperation of

the property manager of the next-door apartment complex to not use pesticides on or off the property. Further, the other manager was willing to work with EGP members to post bilingual, informational flyers suggesting that the residents of the apartment complex use fragrance-free laundry products.

Frank said, "I tried to make agreements with the landscape companies. I couldn't get them to stop [using pesticides, but] I got them to agree to call in advance [if they would be spraying]. [Additionally,] I got the apartments across the street to notify us about house painting." Ecocase Board President Ben Granville told me that the Homeowner's Association was "cooperative within reason, but not as cooperative as they could be. [For example,] we couldn't get them to stop using pesticides."

When the apartments next door were under construction, Frank tried to work with both the builder and the owner to mitigate exposures to Ecocase residents. Frank was not pleased with their reaction: "Their attitudes were dismissive. They laughed in my face." Many aspects of building caused harmful exposures to residents at Ecocase. First, they used forming boards with a petroleum product. "They coated it with diesel fuel and left it on the north side of the property with the wind blowing toward us. They did this on a Friday and left it until Wednesday. I think they did it on purpose." Second, the contractors drove heavy loaders into the yard of Ecocase, tearing the back fence, riding over the landscaping, and tearing up the curb. Third, they left barrels of "toxic sealants" for the patios in the open without covers for a long time. Fourth, they created dust and noise that could have been prevented through containment strategies.

Frank said that Board President Ben Granville discouraged him from some of his efforts to secure cooperation and understanding in this situation. In another situation,

Frank averted potential problems from pesticide use on land adjacent to Ecocase by negotiating a favorable legal agreement for Ecocase to landscape an easement at the corner of Ecocase property that actually belonged to the development across the street.

### Greencase Neighborhood Relations

At Greencase, with strong prevailing winds from the ocean, effects from neighbors are often mitigated, but not always. For instance, residents report adverse health effects when the neighbor does laundry, which causes scented laundry products to be vented outdoors and, depending on the winds, toward Greencase. In another example, a neighbor's house was being tented and treated for termites with pesticides, which forced some residents to evacuate Greencase. Generally, Greencase has not approached its neighbors to request any actions or behaviors from them. One exception has been Conrad's request that her neighbors call her when the county truck passes spraying pesticides so that she can alert guests to close their windows.

## Community Relations, Outreach Activities, and Publicity

### Community Relations, Outreach Activities and Publicity at Ecocase

The early board endorsed an activist role. They agreed that they had a broader role in advocacy for the MCS community and for the education of the public at large. It was discussed and voted on at a board retreat in the summer of 1997. "The original board used to have these great, involved discussions, very seriously considering their role, the role of Ecocase, the future developments. They wrote a mission statement, and adopted it," said one interviewee. Also, there was an Ecocase pamphlet that was to be sent to

anyone who called with inquiries. When it was sent out, donations were requested to cover costs. This is no longer done.

The EGP holds many meetings and events in the Community Room of Ecocase. Their support group for people with MCS is followed by a potluck; it meets monthly and is open to the public; some attendees drive from as many as four hours away to attend. EGP also organizes speakers, holiday parties, and environmentally safe haircuts. It surprised new attendees and delighted repeat attendees to discover that they must argue over how to accommodate each other during the EGP events, rather than whether accommodation is necessary. For instance, a perennial problem occurs when one attendee would like the doors open to allow fresh air in, while another wants to seal the room and turn on all the air filters to high; but, no one questions the need to reduce personal exposures to chemical pollutants.

For the founders of Ecocase and many members of EGP, Ecocase itself is an activist project, advocating for the needs and rights of people disabled by MCS. They would like to see the Ecocase board embrace an activist role in community relations, outreach, and publicity. They would like to see Ecocase "serve as a seed for the local community," as one interview said.

The Ecocase Board allowed the EGP President to take the lead on a range of activities. She hosted the visit of the members of a committee on disability access interested in the Americans for Disabilities Act. She has been giving presentations to local Independent Living Centers, Ascension Housing affiliates, and to the City of Norcal. She also arranged for Ecocase to be on the Green Homes Tour of Ariel County and gave an orientation tour for the forty to fifty individuals who came to visit. Because

of this tour, Ecocase received a building award as a multifamily property. This tour and subsequent award led to some good publicity for Ecocase. It was suggested that Ecocase seek LEED certification for their green building. LEED, the Leadership in Energy and Environmental Design Green Building Rating System, is administered by a private, non-profit organization to certify that buildings have met certain performance criteria for sustainable design. However, some members of EGP, Ecocase residents, and environmental health advocates have criticized LEED's lack of priority for criteria that would reduce pollutant exposures for occupants.

**Community Relations, Outreach Activities and Publicity at Greencase**

Conrad is in regular contact with other MCS activists in the U.S. and Canada, including other people trying to open or manage housing for people with MCS. She is less involved with organizations that promote tourism because she does not wish to attract the general public, and because most tourism services would not be of interest or accessible to people with MCS.

One reason that Conrad has not engaged in more community outreach activities is because of the demands of owning and managing Greencase. Conrad initially wanted good publicity for Greencase and envisioned her business as a local hub for environmental activism by getting involved in environmental issues in the Morris, Florida area. She had hoped to build another healthy residential development for people with MCS but also backed away from that goal, given the demands of the Greencase.

## Government Relations and Planning Issues

### Ecocase Government Relations and Planning Issues

The City of Nadal will have a new green building ordinance, according to an interviewee, and "it looks pretty good. [Two Ecocase residents] are involved in that…. They do have components that deal with indoor air quality. Fairfax, a nearby city, has a pesticide notification law. Both the city and the county have IPM ordinances. Seven or eight of the school districts now have IPM policies on the books."

One former property manager contacted several local government departments as part of continued efforts to reduce exposures for residents. He made an agreement with the Parks and Recreation Department to provide Ecocase with advanced notice before paving and painting the curbs in the area and on the sidewalk. The City of Nadal sends a fax to the property manager to announce roadwork in the area. He went on to say, "The Public Works department… they no longer do it. …You have to maintain these relationships." At least one subsequent property manager ignored the faxes.

This same former property manager also reached out to many government departments to affect pesticide-use and related policies. "The City was very compliant," he said. The City of Nadal agreed to give Ecocase one-week notice for any planned pesticide use in the area. They sent a fax to that property manager, who did additional research on behalf of the residents and reported data that described what pesticide was to be used and resources that could be used to limit exposures. He also sent a letter on behalf of all people with MCS to make the county aware of the issue of MCS and to ask them to adopt a pesticide notification policy as part of the Mosquito Abatement District of Ariel County, which was included.

In addition, he arranged with the city to "adopt" an area of land near the Ecocase and take care of the weeds. The city had been spraying pesticide on a nearby street island. A resident found a local tree removal company that periodically has extra shredded bark. Instead of the city spraying pesticides, the private company comes and spreads its bark on the island, thus preventing the weeds from growing.

This former property manager, residents, and members of the EGP have also shaped the IPM Ordinance for Ariel County. "It resulted in a 90% reduction [in pesticide use] in Ariel County in the first year," one interviewee claimed. However, getting an effective IPM policy in place was not a smooth process. One interviewee said, "The county employees and the Agriculture Commissioner fought us tooth and nail all the way … [The California Department of Pesticide Regulation decreed that] no other government entity can regulate pesticides… even notification [policies]. … I used to butt heads with him [the Agriculture Commissioner] every other week for three years. … He tried to run the [IPM] Commission instead of the other way around."

**Greencase Government Relations and Planning Issues**

For Greencase Condos, Martelli sought permission to add one extra housing unit. His idea was that the rental unit would be available to visiting guests of the regular tenants and condo owners, who would like to be able to host their friends and family, many of whom did not have MCS. The zoning board objected to the extra unit, deciding that Martelli could add up to 25% onto an existing unit, but not place any additional kitchens.

At Greencase, a long-term problem has been the government-sponsored, aerial pesticide spraying for mosquito control. One year the truck sprayed the property, and it

came as a complete surprise to everyone there. Conrad secured an informal agreement from the county to not to spray her property, by pointing out that her property is near a protected area for sea turtles, which is not sprayed.

Conrad and her guests have gone before the Commissioners of Clerk County to present a case against spraying. There were immediate objections to making any changes that might reduce spraying, because the county budget had an allotment devoted to the purchase and use of pesticides, and if the county did not use the budget, then they would lose the funding. Nevertheless, the commissioners agreed 5:0 to form a committee to examine pesticide use within the county. The committee met and held many meetings, but Conrad said that the members of the committee were sent by the State of Florida Health and Agricultural Departments to voice strong support for pesticide spraying.

Conrad presented the committee with evidence to support the position that the county should employ safer and more effective means of mosquito control, but she felt it made no difference. The commissioners voted 3:1 in favor of using existing spraying techniques. The only change was that the county would be divided into squares, and it would be possible to find out which square of the county would be sprayed next. Conrad felt that the suggestion to form a committee to examine pesticide use had been made just to "calm us down."

Water quality was also problem at Greencase, related to the use of chlorine, which is no longer used on the property. People with MCS typically cannot tolerate chlorine. But state drinking water regulations required the chlorination of their well water. Consequently, chlorine was being added to the well water, then removed with a central water filtration system at Greencase before going to the units. This practice led to

problems for residents with MCS, such as exposures from accidental chlorine spills, and from chlorine remaining in the water when the filtration system was not working.

The water on the property comes from four wells, which were tested four times a year. Conrad acquired permission for Greencase to become the first commercial test site allowed to switch from a chlorine-based system of disinfection to hydrogen peroxide. This permission occurred when the man who checked the water quality turned out to be married to a woman who is a chief decision-maker for the county. Conrad said, "You have to have a lot of 'ins' and 'good will.'"

## Funding for Operation, Maintenance, and Renovation

### Funding and Resources for Both Healthy Residential Developments

Ecocase was able to secure and receive two CDBG grants to do repairs and renovations that were needed during the first five years of the building's occupation. These two grants helped cover the costs of sealing the flaking wallboard and redoing the fixtures that had baked-on enamel paint, which had not been tolerated by most of the early residents.

These resources, and being careful about spending, enabled the property manager to balance the budget, in his view. He operated "on a shoestring" by finding used or on-sale items and soliciting donations of objects and talents, such as having a voluntary appraisal of the property after an earthquake by a structural engineer. He had furnished his office through donations, including equipment such as a computer and fax machine. He also did work himself, whenever possible, rather than hire contractors.

At Greencase, Conrad and Martelli have expanded their financial stability by owning multiple properties. Conrad has "a huge mortgage," and she wants to get out of

debt. Part of her strategy has been to acquire additional rental properties, which are not run for people with MCS, and make them profitable.

**Rental Income Versus Safety: An Issue for Both Developments**

A housing unit in a healthy residential development cannot be rented if it becomes unsafe due to pollutants. Some repairs cannot be made quickly in a way that will be completely safe for current or future tenants. In addition, if a housing unit becomes unsafe for people with MCS, and then the owner will not be able to rent it at all.

Both cases have faced contamination issues in certain housing units. Ecocase had a unit that no one wanted to rent for a long time because it had a certain smell. Greencase had a unit in which someone had sprayed pesticides, and could not be occupied by someone with MCS.

Neither healthy residential development has insurance to cover contamination that would render a unit unsafe for someone with MCS, and the consequent loss of rental income. While both Ecocase and Greencase Rentals require deposits, that amount would not necessarily cover the full costs of repair and foregone rent.

It was not possible to determine, with available data, whether either Ecocase or Greencase can cover its operating costs from rental income alone.

**Ecocase Funding: Residents' Fear of the Board**

A major portion of funding for the Ecocase comes from the HUD Section 811 program. This program provides money as a capital advance for construction or acquisition and also as a rental subsidy to cover the gap between HUD-approved operating costs and the tenants' price for rent. The language of this HUD program

requires that the housing units be rented to very low-income people with disabilities, but it does not require the people with disabilities to have MCS.

The requirement that low-income individuals be disabled by MCS is part of the by-laws of Ecocase, Inc. As one resident said, "All it takes is a vote of the board to take away the preference for people with MCS." This option has been considered by various board members and mentioned numerous times at board meetings. And this has caused distress among the residents.

"We are walking a tightrope in having demands on the property," one resident explained. "We are always scared to come with requests or with problems. …The board would rather change to [general] disabilities."

The consideration of changing the by-laws from a preference for tenants disabled by MCS to an allowance of any disabled tenant partly originates with some board members who are disdainful of or frustrated with the current residents. Some residents, in turn, feel that their housing is under threat from the board. Some residents are afraid to go to the board with problems for fear that the board will change the by-laws to remove the preference for MCS.

This funding situation creates insecurity for some residents that prevents them from sharing their concerns with the board. Though it would be unlikely that the board would make such a change, the fact that it has the power to do so leverages its position with respect to the residents.

**Greencase Funding: Residents' Fear of Plans to Sell**

Because residents are dependent on Conrad for their "safe place," they are also worried that she may get tired of running Greencase, and shut it down. At one point, this

fear was realized. Conrad held a meeting with the residents to announce that she was going to sell Greencase. The residents were silent and terrified. As one long-term resident explained, "With MCS, your life depends on having a safe place. When Conrad said she was selling the place, it was like being put on death row." Although the plans to sell were delayed, and residents continued to live at the Greencase, it nonetheless accentuated the frailty of home security, and the dependency of residents on the owner.

## Focus on Property Management Factors of Continuation

Most factors of the continuation of a healthy residential development concern the ways the property is managed. The previous sections examined general factors of property management: governance; relationships with their neighborhoods, communities, and local governments; and funding for operation, maintenance, and renovation.

The following sections focus more on everyday ways that the properties were operated and maintained. New residents are attracted to the property, vacancies are managed, rules are followed or broken, residents socialize, residents make changes to their units, property managers change and have different styles of management, and decisions are made about repairs and major renovations.

## Prospective Residents and Vacancies

### Attracting Residents at Ecocase

During its construction, Ecocase first advertised in several local newspapers, on the website for the EGP, and the organization's newsletter. The news of the construction of Ecocase also spread by word of mouth. In addition, Ecocase promoted itself during its

participation in a 2005 Green Home Tour, when over 50 people toured the property. Some independent living centers also make referrals.

To rent at Ecocase, a person must have a doctor's certification that they have MCS as a disability. They also must be considered very low income for Ariel County, which is a relatively wealthy county in the U.S. They must submit an application and be accepted before they can sign a lease.

**The Waiting List at the Ecocase**

When Ecocase began accepting applications, "the response was overwhelming." One interviewee said, "People were waiting for when they could apply." So many people applied that the Resident Selection Committee, which was formed by the board, held a lottery to select which applicants would be offered a lease. The remaining applicants were put on a waiting list.

Since then, individuals who want to live at Ecocase write or call the Ecocase, and the property manager adds their names to the waiting list. The list once exceeded 120 individuals.

One current resident said, "It took me a long time to get on here." In fact, he tried for five years. He was homeless living in a van and in campgrounds. At one point, he was told, incorrectly, that the list was closed. He called repeatedly during a period of time when a property manager, one who was later fired by Ascension Services, was not responding to calls.

The list is managed according to HUD and Ascension Services rules. One former property manager said, "Once a year, we did a mail out of all the people on the list. …It was an enormous amount of energy just to maintain the list." The property manager had

to personally print each letter with the listed name and address and fold, stuff, address, and stamp each envelope.

The waiting list was capped at 100 names for two reasons. One was that the lengthy list was difficult to maintain. The other was that the list only applied to potential vacancies, and there were not that many units. Of the original 11 residents, 8 of them still live at Ecocase.

The update of the waiting list occurs annually. Of the 100 people on the list, more than 40 people will drop off the list. Then, the list is re-opened for inquiries, and swells to more than 100 names by the end of the year.

**Attracting Residents at Greencase**

The owner of Greencase Rentals has placed ads in magazines for people with MCS, and developed a website. Greencase Condos also has a website for information and bookings.

At Greencase, guests must be able to pay market rent and a security deposit, be willing to abide by the rules to reduce personal exposures, and the owner must sign a lease agreement with them.

Before arriving, prospective guests to Greencase call for information and to book a reservation. During the call, both the guests and the property managers screen each other to see if the relationship is a good fit for renting.

Martelli, or his assistant property manager who is a resident, takes the calls for the Greencase Condos. They talk to people about the specific products that they use as a way of judging their physical needs.

Conrad spoke at length about how she has learned to screen prospective guests: "I began listening really well to what people have to say about themselves." Essentially, Conrad talks to prospective guests in general ways, and she uses her intuition to draw a conclusion. She especially looks for an attitude of gratitude, someone who will appreciate a safe place. She screens out chronic complainers, or guests that are likely to demand that she take care of them, and then criticize her efforts.

Conrad said, "I used to have a long list of questions for people. That's secondary now." Her long list of questions had included what products people used as a way of making sure that they were living a lifestyle that was sufficiently compatible with the environmentally health goals of Greencase.

Martelli, the owner of Greencase Condos, stayed at Greencase as a guest for over five years. He liked it so much that he bought the north half of the property. Most of his guests and residents had met him while he was a guest. The guests and residents trust the owners to take care of their environmental health concerns in managing the property. This relationship often begins with a call to Greencase to inquire about renting an apartment or buying a condo.

**Filling Vacancies at Ecocase**

When a vacancy occurs, the people on the waiting list are contacted. The occupancy procedures require each prospective new tenant to stay at Ecocase for 48 hours before they sign a lease.

Some people would try to stay for 48 hours, but "they couldn't last that long" because they could not tolerate the unit. Sometimes, people would stay for two days and would ask to stay a third day. The purpose of the free stay was to allow the prospective

tenant to evaluate the unit to see if it would work for them. One property manager said that there were four vacancies during his tenure, and "went through 60-80 people before I rented one unit."

The requirement for a 48-hour trial stay before signing a lease is intended to help Ecocase to acquire and retain tenants. It also helps prospective tenants, so they don't move in and sign a lease, only to discover they can't live there because of exposures. Consequently, most tenants who have signed leases have stayed a long time.

Ironically, despite the long waiting list, filling vacancies has been a problem. A primary reason relates to the difficulties of making contacts with individuals on the waiting list.

When the property manager contacts the first person on the list, they must allow time for the prospective tenant to receive the letter, evaluate the notice, and respond to it. However, people with MCS can be difficult to reach by mail. They may not have an actual home, or a stable address. They may move, and the post office may forward their mail to a new address – an address where they might not actually reside, but perhaps check their mail weekly or monthly while living out of a car or in a tent in the area of their mailing address. Some individuals may receive their letters, but then be too sick to respond to them. In the beginning, the property manager only contacted the first person on the list. The amount of time waiting for a response was long, dragging into weeks and months, and too frequently no response was received at all.

This time lag led to several board decisions. One was that the property manager should contact ten people on the waiting list at a time to notify them of the vacancy. The first person who can arrange a visit for the 48-hour trial stay and complete an application

is the preferred candidate to sign a lease agreement. Another was that the board shortened the time allowed before an appointment was made in response to the notice, and they lengthened the time they would allow for people to have a test period before they chose to sign a lease agreement.

During this period, the board was concerned about the loss of rent. So, the property manager went through the HUD process that allows an apartment building to re-coup the vacancy loss income for extraordinary circumstances. HUD granted them over $800 in vacancy loss income.

**The Initial Stay of New Guests at Greencase**

When new guests arrive, the current residents "go sniff them out"; the owners both sniff people out too, and they talk amongst themselves informally. Because Greencase has 11 apartment units, the guests and managers figure out pretty quickly whether new guests are going to be safe and friendly. Conrad said: "People don't bring very much. In general, they just bring their clothes. Those who come alone are self-sufficient." Many guests act tentatively in their initial stay, returning for longer periods.

At Greencase, Conrad typically spends more than $75 to clean an apartment between guests, and, while she often does much of the work herself, she also hires help. It typically takes between 4 and 8 hours to wash the walls and ceiling and floors and all the bedding.

## Rules Governing Residents

### Rules and Rule Breaking at Ecocase

Ecocase has a list called Rules for Residents, also called the House Rules, passed in the second year. It is a legally binding part of the lease agreement that can be amended by the board. They begin: "The spirit of these rules is to encourage each resident to be aware of how her/his actions may affect other residents and to protect and enhance the health of all residents."

The Rules apply to everyone who comes to Ecocase. The property manager is responsible for enforcing the rules for the residents and vendors or contractors, and the residents are responsible for enforcing the rules for their guests. The Rules are subject to periodic review, and residents are encouraged to contribute to their revision. The residents have had to take the lead to teach each new property manager how to fully comprehend the Rules and how to implement them.

The specific issues covered by the Rules include: what constitutes independent living to meet the requirements to be a tenant, sources of scents and chemical exposures that might be on clothing or people's bodies, what abusive behavior is cause for eviction, no smoking anywhere on the property, no burning even in the event of the loss of electricity, the disallowance of animals and animal dander, noise restrictions, parking restrictions, idling engines, the condition of the apartment units, the property maintenance regulations, personal storage restrictions, the use of paints and glues, the use of approved housekeeping products, the use of the laundry room, the use of electric appliances, the choice of plants, garbage handling, the transfer of a tenant to a vacant unit, guests and non-tenants visitors, the provision of locks and entry to the property, the use of the

Community Room, the use of the Airing Room, the delivery of packages, housing insurance advice, compliance with the Rules, lists of acceptable or unacceptable products for housekeeping, laundry, the Airing Room, and the text for the notice that must be included on all announcements for events held in the Community Room.

Taken together, these Rules do protect residents from exposures when they are followed. The residents take the Rules very seriously, and, with respect to potential exposures, are very diligent in following the Rules. Surprisingly, residents report that the people who have problems following the Rules regarding exposures are not the residents or the residents' guests, but rather the property managers, the vendors hired by the managers, and the Ecocase board members. Also, in the case that a resident has broken a rule regarding behavior that is grounds for eviction, other residents feel strongly about forgiving that resident's behavior. Some residents remember earlier times when they have been homeless, in unsafe housing, or transient.

**Rules and Rule Breaking at Greencase**

The owners both specify rules governing behaviors and product use at Greencase. For instance, Martelli's guests are required to abide by a "Quality Assurance Agreement" that asks guests to, for example, use their clothesline for outgassing items instead of their front patios, and not to smoke or bring pets onto the property. Guests are required to run either a forced air central A/C and heating system or a stand-alone dehumidifier to prevent moisture from building up in the units. Pesticides and fragrances are, of course, prohibited. Martelli provides rule-breakers with "warnings" and "education," and he talks to people and tries to work with them.

## Resident Relations

This section discusses resident relations within the two healthy residential developments in a social context.

### Safe Socialization and Empowerment

For many individuals, one characteristic of living with MCS is being socially isolated. Healthy residential developments create safe areas for people with MCS, and thus can lead to friendships, social events, advocacy opportunities, and community building activities.

A benefit, mentioned by residents, of living in a healthy residential development is the feeling of empowerment that comes with being understood. Lucy Mahar, one of the original residents of the Ecocase wrote about this feeling (Mahar 1999):

"This is a place set up with this illness in mind, one where everybody 'gets it.' That's very empowering. A huge percentage of my day-to-day life before I got here was taken up with ongoing battles [to protect my health] …. Now the major institution I deal with—my landlord—and the people who are most in a position to negatively impact my health—my neighbors—understand and approve [my actions]. They *get* that avoiding exposures is necessary and healthful. I can't tell you what a difference that has made in the amount of emotional and spiritual energy I have available every day simply because I don't have to use so much of it up defending and justifying myself."

At Greencase, individuals who arrive look forward to not being socially isolated. Residents meet other people whom they can physically tolerate and whom they want to get to know. The owner said there were many people "who came for just one week and realized that life is not over when you have MCS."

**Getting Along Well With Others Or Not**

The intention at Ecocase was for all residents to participate in a Resident's Council where they could work together to create resources and opportunities for themselves within Ecocase, an idea that is much in tune with the Independent Living movement's emphasis on disability empowerment. But, the Resident's Council has not fulfilled this ideal.

When Ecocase first opened, the differences among the residents involved conflicting ideologies, such as religious, ideological, and personal preferences, such as hobbies. When the place opened, said one resident, "It was a miracle it didn't melt down."

In recent years, one thing that has "created tensions among residents" originates with a change in the way Ecocase treats the Waiting List, explained resident Mahar. In the first couple of years, "anyone who was homeless or spending more than a certain percentage of their income on housing had to be given federal preference. … They went to the top of the Waiting List." Thus, the initial group of people who came to Ecocase were more likely to have had "no social safety net." Ecocase no longer has to give certain people preference. "The new people have probably never been that poor. …They have never been that far down on their luck. …The new people … can be hard on people who have been there since the beginning."

Despite these tensions, interviewees were generally very positive about resident relations. One said: "We know each other. We trust each other. …We don't have huge conflicts between residents."

At Greencase, one couple who came annually listed their favorite thing about Greencase: "The people are just wonderful!" For that visit, the couple had arrived to Greencase during a cold spell: other residents had lent them a portable heater, an extra blanket, and an extra quilt. Another former resident of Greencase said, "We all look after each other. We are very protective of each other."

The owner of Greencase explained that many of the residents are trying to recover their health. As a long-term resident, she sometimes felt "bombarded by others' problems." At times, she has avoided other residents because she does not want to hear them complain. She cannot ask them how they are or how they are feeling without getting a long and involved response about their health problems.

### Residents' Abilities to Make Individual Adjustments to Units

People with MCS often have particular sensitivities and preferences for their own housing in healthy residential developments. Most residents at both cases had made changes to their apartment units to accommodate their unique sensitivities.

At Ecocase, the Rules for Residents specify that some changes are permitted or disallowed: "Residents may not install shelf paper with any type of adhesive, including paper with self-adhesives." And "Residents must obtain permission from Ecocase, Inc. before installing foil or other wall covering, wall shelving, hanging fixtures, or anything which might damage the apartment interior." Notably, residents are allowed to use Scotch tape and thumbtacks.

These rules protect residents from exposures to adhesive materials, which often contain polluting substances. They also serve to prevent the vapor barrier from being compromised. The vapor barrier is part of the design of Ecocase buildings, which creates

a barrier between the interior construction materials and the living spaces of the buildings. Longer nails, for example, could puncture the vapor barrier. One interviewee suggested that the vapor barrier had been compromised in several places. Where the vapor barrier is compromised, tenants are at risk for pollutant exposures. No one suggested that such exposures have been a problem for anyone yet.

At Greencase, several individuals had used Denny (aluminum) Foil to cover objects that they could not tolerate to separate the off-gassing and offensive object from the living space. One person put Denny Foil over the water heater and the A/C unit, which he considered very minor changes compared to what he had tried to do to remediate the most recent house he had owned. Another person had problems with her closets, and she had chosen to wash them down and then seal them with Denny Foil and then not use them.

At Ecocase, a reverse-osmosis drinking water filter was installed in the Community Room so that the tenants could take water up to their apartments. Many of the long-term renters at Greencase had installed water filters on their tap water for drinking and showering, though some had subscribed to delivery services for drinking water. Some of them also have water filters for drinking or bathing. Both healthy residential developments have water filtration for the whole buildings. The additional filters that tenants install are an added measure.

## The Selection of Property Managers

This section examines characteristics of property managers and the specific requirements of property management for healthy residential developments.

**An Overview of Property Management of Ecocase**

The board of Ecocase acted as both the owner and the manager of Ecocase when it first opened. The first board did everything themselves because they felt "that no one else would understand [the needs of disabled MCS residents]." Ecocase had three property managers during the first two years before they hired Michael Frank, who understood exposure management as a specific part of his job. The board membership changed, the board began to meet less often, and the new board decided to hire Ascension Services, a property management company. Frank, the property manager who was working directly for Ecocase, was rehired under Ascension Services as the property manager. Ascension Services also assigned them a Property Supervisor, to whom Frank began to report directly.

Over the years, Frank had methodically put together a Rolodex full of experts in different areas of property management. It included over 80 vendors who Frank had trained to be fragrance-free, to not smoke, and to discuss methods and materials in advance of completing the scope of work. Moreover, they could be referenced to records of the vendors' work. He had three logbooks filled with documentation on the repairs for each unit. He had five one-hundred-page long notebooks of phone logs. He put together resources and materials into a library that he, in collaboration with the residents and the original board, had set up in the Community Room for the residents to use.

After Frank resigned, Ascension Services and the board hired a new property manager, Jacob Gifford. "Gifford tossed it all out," said Frank, "How do you characterize that?" He also threw away the protocols describing methods Frank had established for resolving disputes between residents using mediation or resolving disputes

between a resident and the property manager. Frank had put together handouts for vendors coming to Ecocase to make repairs, and it is not clear if those survived the new property manager's clean-sweep of the office.

In interviews, three residents and one property manager each said, independently, that they thought Gifford was an "industry plant," a person put into that position by the chemical industry to try to make Ecocase unsuccessful. The residents and others in the MCS community cited numerous examples of his mismanagement. For instance, Frank had arranged for the City of Nadal to notify the Ecocase by fax when they had plans to do street repairs, and then Frank had written memos for the residents to let them know. But "Gifford refused to Xerox them and deliver them to the residents," according to an interviewee. Allegedly, under Gifford, there were "thousands of dollars out of balance." Plus, Gifford purchased a new desk, new office furniture, and a new computer, whereas Frank had obtained those items through donations.

The residents accumulated a long list of complaints about Gifford. Every resident signed a letter. They gave it to the new Ascension Services' Property Supervisor after the previous one had quit over similar problems with the Ascension system that Frank had experienced. The residents did not hear back, though one resident called Jacob Gifford when he went to his office to remove his belongings (and, it was suggested, to destroy any evidence of wrongdoing) and was told that he could not talk because he was being fired.

Ascension hired a new property manager who came two days a week, and an assistant property manager to do the maintenance. Several individuals reported that they had problems with the assistant property manager: "He does not have a clue [about how

to be fragrance-free]. He thinks it is just things that don't smell." Both the residents and the property manager talked to the assistant property manager about what products he should and should not use. Frank added, "The purpose of Ecocase is to have a fragrance-free environment. The Ascension maintenance person, after 3 years, still does not come fragrance-free."

With each new hire, a new property supervisor, a new property manager, or a new assistant property manager, the responsibility of training the new employee fell to the residents. They were the ones to present the House Rules and explain how to enforce them. Then, they were the ones to help the new hires to do their jobs.

**An Overview of Property Management at Greencase**

The owners of Greencase are both very concerned about reducing pollutant exposures in housing and communities, and had experience doing it. Together, the owners and property managers and their maintenance helpers have experience accommodating other people's sensitivities in housing situations.

Conrad herself reflected on her years in management, "I can laugh at everything eventually." In particular, Conrad spoke extensively about how she learned her personal boundaries on the job. She said, "I was forced to learn. In the beginning, I ran myself totally ragged trying to accommodate each person. …I moved furniture. I stored furniture in my garage, but these things would rust in the salt air. …I found that my furniture was molding in the garage. …I would end up with their mattress in my house."

She hypothesized, reflecting on Ecocase, that it might be easier if the housing were not owned by one person. She talked about how, in Nova Scotia, there was "not

one place left out of four MCS communities that started up." She said it was just too hard to accommodate people with MCS in housing.

**Skills Needed for a Property Manager at a Healthy Residential Development**

Former Ecocase property manager Frank said, "It is important to be consistent, to treat everyone's concerns seriously." He felt strongly that establishing trust was an important component of being a good property manager: "It helps them to feel safer and to lower their anxiety level." He added, "There are enough unanticipated exposures just in the neighborhood."

Frank also said that a manager needs good interpersonal skills to develop rapport with each individual at the property so that the manager and the resident can work together. He said, "I related to each resident differently."

Gifford said, "I am trying to maintain objectivity." In his view, objectivity was required of property managers. Setting your own boundaries and distance was more difficult to do if you live with the people you manage. One requirement was "being able to depersonalize." He said, "You have to set boundaries [in terms of what you are supposed to do and what you are willing to do]."

He went on: "This is not supportive living. This is independent living. …They [the residents] need to provide their own resources." He said, "I am not a social worker. I am not a counselor of any type."

Frank made an observation: "Ecocase was like a little rowboat that was swamped with the 800-foot tsunami that was Ascension. …It had a deleterious effect on Ecocase that still exists today."

## Property and Building Maintenance

The follow examples illustrate how and why minor repairs and routine maintenance were carried out at Ecocase and Greencase. These examples are notable for having characteristics of property management specific to healthy residential developments or for showing changes in management activities.

### Light Fixture at Ecocase

In the early years of Ecocase, someone repaired a light fixture in the Community Room. It was a minor repair, but a product containing solvent was used, and it took six to eight weeks to off-gas. For some residents, it ruined the room. The time at which this repair was made marks a change in which certain individuals who used to tolerate the room were no longer safe in that room. They attributed the contamination of the room to the repair of the light fixture.

### Recaulking in the Bathrooms at Ecocase

For Ecocase, Frank recaulked in the bathrooms of most of the units. He used a 100% silica caulk that is frequently chosen by healthy builders and managers because it "detoxes" or "cures" in 24-48 hours. Once dry, most chemically sensitive people, even very sensitive people, can tolerate it. However, when it is applied initially, it emits fumes. Frank would turn on the powerful exhaust vents in the bathrooms and open the window a crack, which had the effect of pulling in air from the areas of the building common to the apartment units and venting it high above and away from the building. He applied Denny Foil to the sides of the bathroom to seal it and used blue painter's tape to seal around the door. Then, Frank would apply the caulk and let it dry. Meanwhile,

the resident would be able to use the rest of his unit and the bathroom adjacent to the Community Room.

**Lawn Care at Ecocase and Greencase**

At Ecocase, lawn care involved weeding by hand under one property manager. Other property managers were not as concerned with non-toxic lawn care. One assistant "was very put out" when residents told him that he could not use his gas-powered lawn blower because it caused pollutant exposures.

Greencase Rentals has more than twice the acreage of lawn than Greencase Condos. Conrad used a gas-powered lawn mower. Martelli used an electric lawn mower. Conrad explained that her side of the property was too large to use electric lawn mowers, saying that it would have required three electric lawn mowers. Conrad believes that the residents know when to expect the lawn to be mowed and that they can close their windows to wait for the fumes to dissipate. Some residents complained about reactions from exposures gas fumes, both in their units and on the Greencase property, and said electric equipment would have been preferable.

**Pest Control at Ecocase and Greencase**

At Ecocase, pest control and lawn care has changed under various property managers. For pests, one property manager has used a borax and sugar mixture to attract and kill sugar ants, and, according to one resident, he used highly toxic poison to kill rats. Neither caused any known pollutant exposures on-site.

At Greencase, the owners use least toxic methods or pest control, such as borax (i.e. sodium borate), boric acid, and Terro. Conrad also used "mosquito magnets" on the property, one on each side.

Martelli and Conrad control pests on the property with care for the health of the residents, using non-toxic approaches. Nonetheless, several residents claimed to have caught both the owners using toxic pesticides on the property: "The bad stuff. I saw a bag of it," said one former resident. To clarify, neither owner has used any pesticides inside any of the units. Their use of "the bad stuff," as one interviewee put it, was on the outside lawn, to control an invasive species of fire ants.

**A Stove Repair at Greencase**

A resident's stove broke, and that resident would not allow the repairman to enter the unit for fear of pollutant exposures. So, the property manager agreed to remove the stove from the unit, repair it outside, and then they put the stove back into the unit.

Many people with chemical sensitivities are concerned that they will not be able to tolerate the process or results of repair work; thus, they may not report a problem that needs to be fixed or they may not allow the repair work to be done. Conrad noted, "The same people who would not let you go into their apartment to fix something will then be angry when it goes unfixed." Martelli said something similar, and he told a story about a tenant of his at a different apartment complex who did not report a plumbing leak out of fear of pollutant exposures during repair. This leak led to mold damage in that wall and to the ceiling caving in on a downstairs renter with chemical sensitivity.

**Shared Washing Machines at Ecocase and Greencase**

Both healthy residential developments have shared, coin-operated laundry machines. They specify the allowable laundry products for use in the machines. Both allow baking soda.

Ecocase provides washing machines for the residents to share. During a certain time, these machines were constantly breaking down. The cost of repair was high. Frank was able to negotiate a special contract with the makers of the washing machines. This contract allowed Ecocase to lease new washing machines under a warranty that required the company to make repairs at their own cost.

The machines were new, because previously used washing machines and dryers are generally infeasible for people with MCS. Previous machines retain fragrances and other substances, which can migrate onto and contaminate future loads of clothing. As people with MCS explain, it is virtually impossible to "decontaminate" a machine, once typical laundry products have been used, or your clothing if you use such a machine. One resident calls their washing machines "virgin machines" because they have never had other people's laundry detergents in them. The special contract ensured that Ecocase would always have new washing machines kept in good repair at an optimum cost with minimal burden of responsibility to the management.

At Greencase, a problem for residents has centered on how to share the washing machines. Two coin-operated washing machines were located in the laundry room, and one was exclusively for clothes being washed in baking soda, and the other for a few approved products. New guests may arrive with scents on their clothing, and it causes the other residents' clothing to become contaminated with those scents. Moreover, as one former resident said, "The washing machines were always breaking down." One goal of the owner of Greencase Condos was to provide each unit with its own washing machine.

## Property Management Decisions

This section examines how property managers address issues such as training workers, repairs, and protocols.

### Training Workers at Ecocase and Greencase

Managers in both healthy residential developments have trained vendors, contractors, and workers to arrive fragrance-free and to use least toxic methods and products, as well as to take a collaborative approach to gain approval from the property manager before completing repairs.

At Ecocase, at least one former manager was remiss in training workers, while another had formalized the training by mailing or faxing training handouts in advance of visits.

At Greencase, both property managers advised their workers not to smoke or wear perfume. Both also gave their crew free fragrance-free shampoo, soaps, deodorant, and laundry detergent. They also gave fragrance-free products to "the A/C man and the plumber." By giving them products for free, they encouraged them to arrive to work with fewer scents, which reduces the potential for residents to be exposed.

Compliance with the training and requests varies widely. Managers at both cases have sent contractors away for arriving fragranced, asking them to return fragrance-free.

## Major Repair and Renovation Decisions

### Major Repairs at Ecocase: Sealing the Wallboard

The wallboard, which was advertised as 100% gypsum, actually contained a filler, fly ash (a waste product of incinerators). The board decided to seal the wallboard. Frank

was property manager at the time, and he researched dozens of paint companies. He requested and received many paint samples: "We got samples from the contractor of the wallboard made up." Then, the samples were allowed to off-gas for a couple of weeks.

Each resident had a chance to review the 30 wallboard pieces with the different paint samples. "Every single person participated. …Every person selected [a certain brand]." Frank said, "It took one-and-a-half years to select the paint."

First, the Community Room was painted, and Frank again got feedback from all the residents. The painting was done around the tenants' schedules: "Everyone had months and months to sign up. …One person signed up and then opted out at the last minute." This person was especially sensitive to all types of paint and loved living at Ecocase, and would not risk her apartment becoming intolerable.

Each wall received four coats of paint. One coat of paint per week was applied. It was considered toxic when it was wet, but once it out-gassed, "it was a very good sealant," reported the property management.

**Plans for Repairs at Greencase Rentals and Greencase Condos**

At Greencase, Conrad feels that she cannot make repairs because current guests or future guests would not be able to tolerate them. She is also concerned about how she would protect guests on the property while she painted; she does not see a safe way to do it. Further, "there is no VOC-free paint that would survive the ocean." She is concerned that she cannot do more to keep up the property. "It looks like a slum," said the owner about Greencase.

After the hurricane, Martelli rebuilt the whole main house on the bluff using insurance money. This main house is a single-family home with separate in-law

facilities. He built the house using environmentally friendly construction designs and techniques, and he wanted to get into solar power for future properties. Just after the hurricane, he had bought three new refrigerators for tenants and new stoves for all the units, and he was storing them to allow them to outgas for two to three months before he would install them in the units. Then, he planned to use the same techniques for supplying washers and dryers to the units. When Martelli plans to do any work on the property, he provides the residents with a few weeks notice for changes. He also provides them with choices, such as possible paints to use.

**Management Protocols at Ecocase**

Frank designed management protocols that were specific to a healthy residential development. Because these protocols did not survive changes in management, the following description reflects his memories of his best practices:

* A rent protocol for use when interviewing prospective tenants that included questions about what the resident needed for reducing pollutant exposures

* A method for maintaining a list of vendors and contractors that included that they had received his training for coming to Ecocase fragrance-free and using products and procedures that would reduce or eliminate pollutant exposures

* A handout for the property manager to provide to vendors and contractors to train them in fragrance-free work, providing notice for repairs, and using products and practices to reduce pollutant exposures.

* A handout for residents and others to provide to visitors to the Ecocase to ensure that they would arrive fragrance-free

* A method for keeping records of vendors' and contractors' work

* A method for documenting repairs to each unit, including the vendor who made the repairs and the practices and products used for the repairs

* An 8-step dispute resolution procedure for mediating tenant disputes so that disputes could be resolved fairly

* A procedure for dealing with conflict between a tenant and a manager

* A procedure for amending House Rules

* A procedure for government agencies to notify Ecocase if they would be doing roadwork or repairs or using toxic products, such as pesticides, near Ecocase. The government agencies were to provide the EPA registration number for the chemicals, information about how they would apply them, and the date and time for the work to be done.

* A library of resources about chemical exposures in products and organizations that coordinate activism and advocacy for the chemically injured

* Appropriate signage for designating the spaces of the buildings so that visitors and others knew they were entering an area that was restricted in the use of fragrances and other products

* A collaborative approach to working with residents so that they would share in responsibility for the preparation and implementation of plans to make repairs or other changes to the property

# CHAPTER 7: CASE ANALYSIS AND FINDINGS

The previous two chapters presented data and narratives for some of the factors of formation and continuation. This chapter provides case analysis and major findings, both for each case and between the cases, according to these factors. The analysis addresses the following questions, among others: How and why do healthy residential developments form? How and why do they continue? For each factor, what facilitated or impeded these healthy residential developments and their abilities to reduce or eliminate exposures to the extent required by people with MCS? What are the key similarities and differences between the two developments? What can we learn? This analysis provides the foundation for the following chapter, which presents conclusions, implications, and areas for future research.

## How and Why Did These Healthy Residential Developments Form?

*Overall summary:* Ecocase and Greencase each formed with the immediate goal of providing safe and accessible housing for people with MCS. Founders of both developments were also interested in creating more than one housing development for people with MCS. Ecocase was a pilot project designed as a prototype for a much larger development on adjacent land. The Greencase founder aspired to develop a motel where people with MCS would live and interact with others, and pursue activism. These developments formed as part of individuals' larger goals to reduce human exposure to pollutants, rather than solely to enrich themselves through their housing developments. While determination and vision drove the formation of these healthy residential developments, funding was also essential. Ecocase involved many partners to accrue nine sources of funding over several years, much of it intended to support affordable

housing. Greencase was financed entirely by the founder's own resources to acquire a conventional commercial mortgage for a suitable motel to renovate. Both healthy residential developments had to forge methods to build, operate, and manage a property for people with MCS; lessons that were among the most innovative and challenging aspects of these developments. Each factor of formation is now examined in turn.

**Table 3: Comparison of the Formation of the Healthy Residential Developments**

<table>
<tr><th></th><th>Factor of Formation</th><th>Ecocase</th><th>Greencase</th></tr>
<tr><td rowspan="8">How and why did each community form?</td><td>Vision</td><td>To support independent living for low-income individuals disabled with MCS with a new building.</td><td>To create a motel for individuals with MCS via renovation.</td></tr>
<tr><td>Involvement</td><td>Multiple sponsors. Many volunteers. Hired an architect and a builder and a housing consultant.</td><td>Independent initiative. Hired a builder.</td></tr>
<tr><td>Funding</td><td>Nine funding sources, many for affordable housing or disability housing</td><td>Personal investment; conventional commercial mortgage.</td></tr>
<tr><td>Design, Materials, Selection, and Construction</td><td colspan="2">Both: Designs and materials selected to reduce exposures for occupants. Some materials outgassed before installation.</td></tr>
<tr><td>Outgassing</td><td colspan="2">Whole building outgassing procedures, impeded by funding.</td></tr>
<tr><td>Early Management</td><td colspan="2">Learning curve to understand how to reduce exposures during repairs and maintenance.</td></tr>
<tr><td rowspan="2">Site Selection</td><td>Slow growth zoning restrictions, multifamily zoning, funding requirements. Compromise location enabled with inclusionary zoning.</td><td>Adjacent motels for sale.</td></tr>
<tr><td colspan="2">Both: Natural wind. Clean air. Near large bodies of water.</td></tr>
</table>

**Vision and Involvement**

A spirit of activism formed each healthy residential development. Many people volunteered their time and effort. Ecocase arose from a concern for the urgent housing needs of people with MCS. The EGP formed to create housing to accommodate people

with MCS. Their members have a strong belief in the rights and empowerment of people disabled by chemical sensitivities. The Ariel Council for Independent Living provided services to aid individuals to live independently. The individuals who created Ecocase shared both an awareness of MCS in terms of disability consciousness and experience in disability-services provision.

The Greencase Rentals arose out of Conrad's heartfelt desire to change the world. If people with MCS lived together in a safe place, she believed, they would be healthy enough to band together as activists working for environmental health causes. The Greencase Condos grew from Martelli's commitment to healthy housing and green building.

Taken together, these visions were to support and empower people with MCS, to provide housing for a disabled population, and to stimulate activism. The strong visions driving the formation of these healthy residential developments are similar and compatible: each underscores the belief in the ability of people with MCS to live independently, to advocate for the rights of people disabled by MCS, and to build and manage properties in ways that reduce human exposure to pollutants.

**Funding**

Many people are disabled by MCS, and while some individuals or groups of people dream of building a healthy residential development, few have the ability or the funding to do it. Ecocase was started by a nonprofit organization that did not have the resources to act alone to develop this project. After seeking partnerships, Ecocase, Inc. became a privately owned, nonprofit organization with the sponsorship of three organizations. Ecocase had to seek multiple grants and loans, ultimately achieving an

arrangement of nine sources of funding, a majority of which came from five federal awards.

Ecocase also needed to "get a little money in order to get a lot of money," as one interviewee said. A $5,000 CDBG acted as seed money that led to additional grants, making it possible for Ecocase to apply for HUD's Section 811 program that provides a capital advance for construction, as well as for rental subsidies for very low-income people with disabilities. Many MCS residents pay their share of rent using income received from other government sources, such as state or federal disability or Social Security payments. The initial CDBG funding created vital resources for formation, as well as continuation in the form of later grants for repair and renovation.

Ecocase estimated that its healthy residential development cost 11% more to construct than a conventional HUD-funded building (Ecocase and Kodama Associates 1997). The difference was supplied by grants from a county housing trust and three local, nongovernmental nonprofit organizations. This supplementary funding shows that the federal funds did not provide support for the full costs of forming a healthy residential development.

Greencase was developed by a businessperson who used personal savings, a conventional commercial mortgage, and ingenuity to purchase and develop two adjacent, small properties. The founder possessed both the interest in healthy residential developments and the personal ability to develop one, given adequate market resources.

**Building Design, Materials Selection, and Construction**

For these residential developments, designers and builders considered how materials offgas, how to reduce residents' exposures, and how to clean and maintain the property. For both sites, designers and builders were hired who were not necessarily experienced with healthy housing. Instead, both places sought professionals and workers with good attitudes who would "buy into" their healthy housing concepts. Ecocase was built with a mix of "off-the-shelf" and, sometimes, expensive, special-order items, some of which were later difficult or impossible to repair. A few years later, the Greencase founder was able to choose some commercially available and environmentally preferable building materials. She found that some of the less toxic materials were not as durable as their less expensive, conventional equivalents that were reasonably safe for residents after outgassing.

Choosing less-toxic building materials at Ecocase proved difficult due to inadequate labeling and inaccurate or incomplete product information. One example was the presence of incinerator fly ash in purportedly 100% gypsum wallboards, which later had to be sealed to prevent extensive flaking and adverse effects to residents. This experience shows the importance of accurate product information, including disclosure of all ingredients.

The suitability of materials was determined with the help of chemically sensitive individuals who made judgments based on the effects they experienced from exposures. Some testing came at a cost to personal health, shared by many involved in Ecocase, but shouldered almost exclusively by the founder at Greencase. This testing demonstrates the role of residents in construction practice, especially if the housing is being developed

to meet health requirements of those residents. It also raises ethical questions, since, for example, the Greencase founder claims long-term health effects from exposures incurred during materials selection.

The need for construction oversight was a lesson learned by both developments. At Ecocase, in many instances, materials were specified, but substitutions were made by suppliers, contractors, or builders. One reason was that the workers were less familiar with alternative and special-ordered products. Without documentation, these changes will be difficult to discern later when materials are covered or hidden deep in a building; mistakes may be impossible to rectify because a building may not be easily disassembled and rebuilt. Greencase renovation was threatened to be shut down for lack of a permit to build a hospital; it was still a novel idea to create housing for people who are chemically sensitive. When a worker at Greencase sprayed insect repellent indoors, the owner experienced adverse effects for years in that room, even though she did not initially know the cause. Thus, the principles and practices of healthy building can have significant and lasting effects on the formation and continuation of healthy residential developments.

Each case would have preferred detached housing units, but land-use restrictions and the costs of construction and maintenance dictated attached housing. Adaptations such as firewalls provided adequate protection between units for these healthy residential developments and were aided by rules for residents that restricted many of the practices that might have otherwise caused problems.

**Outgassing**

When building and renovations were completed, neither healthy residential development could outgas the buildings and their furnishings before chemically sensitive

renters moved in. For Ecocase, an outgassing period was impeded by occupancy requirements tied to their HUD-funded building loan, as well as malfunctions in exhaust fans and louvers designed to facilitate the ventilation of outgassing pollutants. Ecocase residents complained about outgassing from the new building materials for several years, particularly from the paint on the baked-enamel cabinets and other design pieces. Many attributed their sickness to the new building materials.

For Greencase, outgassing the buildings before occupancy was less of a problem because it was a renovation, not new construction. Furniture and bedding were new, and, in the first few years, numerous guests at Greencase were not able to tolerate them and had to have them removed during their stay.

Many building materials, appliances, and furnishings require outgassing before use. Some products can be outgassed in advance of installation. Ecocase contractors baked some items in the sun and used a storage shed to store larger pieces that would be used in construction. For Greencase, the founder also baked items in the sun, and put problematic materials into large metal garbage cans overnight or for as long as a week. This type of outgassing is advised even for materials that are intended to be sealed and isolated for the interior rooms of the housing unit because of concerns that separation can be compromised.

**Ventilation**

Ventilation is the supply and removal of air in building spaces, typically to bring cleaner outdoor air in and exhaust out relatively polluted indoor air. Because building materials, furnishings, and building uses can pollute indoor spaces, ventilation was planned at both healthy residential developments.

At Ecocase, building designs that facilitated passive ventilation considered the prevailing winds for the alignment of the buildings, the placement of easily opened windows, and the installation of louvers. Ecocase interviewees considered the powerful and quiet exhaust fans in the kitchens and bathrooms of the units effective in promoting ventilation, especially during repairs in the units.

Greencase, which was a renovation of existing buildings, relied entirely on rooms with windows that open to the ambient breezes for ventilation of rooms, and the property manager and the residents supplemented this ventilation using plug-in fans. The owner of Greencase regretted not having installed exhaust fans in the kitchen.

Both cases relied on ventilation to reduce exposure to indoor air pollutants, using exhaust fans and open windows, rather than whole-house filtration mechanisms. Especially during the formation of a healthy residential development, new materials can outgas pollutants into living spaces after construction or renovation. Ventilation and filtration can be useful methods for removing those pollutants.

**Early Management**

When it opened, Ecocase was managed by a board that was faced with unexpected problems upon building occupancy. The first property manager at Ecocase was hired because of knowledge of making standard repairs, but did not understand the role of preventing pollutant exposures, even low-level exposures, which can cause adverse health effects among residents. Through letters, petitions, and participation in housing-board meetings, residents objected that property management did not include the preference for less toxic products and advanced notice for repairs.

At Greencase Rentals, the owner preferred to use less toxic products, but had difficulty in timing the repairs and providing sufficient advance notice. Because many renters stayed for only a few weeks, it was practical to make repairs between renters, which is when the need for the repairs was usually identified. Yet the owner could not know what repairs the next renter would tolerate well. As a result, the owner either made a repair and worried that the new renter would get sick, or avoided the repair and worried that the property was not being kept up. Making repairs safely took practice, and the owner improved, but often worried, nonetheless. The owner learned how to protect guests while keeping the units rented, which often meant not making repairs. Further, the Greencase owner was shocked when renters openly stole property, with the justification that they needed it for their health, and the owner could always buy more.

Learning to manage the property of a healthy residential development was a challenge for both developments, particularly to make repairs without hurting anyone. At Ecocase, the early property managers had to learn as they went along. At Greencase, the owner was careful not to make repairs that a future renter might not tolerate. To be effective, managers at healthy residential developments can be patient and attentive with problems that arise, and involve residents in the selection and testing of less toxic products and providing advanced notice.

**Site Selection**

Site-selection factors are among the most important in the formation and continuation of a healthy residential development because they determine the prevention of many pollutant exposures as well as the concerns of managing real estate, such as maintaining property values. Many factors of site selection relate to the ability of the

healthy residential development to secure good air quality, which is vital to ventilation. Preferable sites for each healthy residential development included areas that were low-density, away from roads and polluting industries, and with a source of fresh air.

Ecocase was restricted in its site selection by high land values, exclusionary zoning, slow growth restrictions, and funding requirements associated with grants and loans. These restrictions taken together made it difficult to find a low-density area that would allow the low-income, multifamily housing development. Inclusionary zoning made it possible for selectors to secure the final site, though it was in an area that was denser than desired and near unwanted high-tension wires. These considerations have made the site unworkable for some prospective tenants.

The high cost of land and Bay area land-use restrictions precluded the development of small, detached cottages with space between them. Though the development had to be attached units in two-story buildings on a small site, which was not what was originally intended, the design of the multiple buildings with a shared courtyard was a solution to the potential problem of cross contamination between attached units, and there have been no reported problems, probably also due to complementary efforts to provide separation and ventilation. The Greencase owner selected a site by buying existing buildings and renovating them. The owner found two adjacent, small motels that had firewalls that adequately separated the units.

Ecocase and Greencase had much in common in site selection. They both found locations in areas with increasing land values and development. They both are located in low-lying areas near bodies of water that receive clean natural wind. They avoided nearby industries known for their polluting ways and chose sites near major parks or

protected areas. Selected sites restricted choices for building setbacks from the road and the location of parking lots. Road-related exposure has not been particularly problematic for either healthy residential development despite their nearness to increasingly busy roads and highways, partly because of natural winds.

Site selectors for Ecocase and Greencase initially sought areas zoned for low-density development. Low-density is often desirable because other residences or businesses can be sources of exposure from vehicles, gas-powered lawn equipment, pesticides, fragranced laundry products, and barbecue grills. However, both places were able to locate in areas with natural winds carrying relatively clean air, which helped prevent exposure. In addition, both Ecocase and Greencase contacted their neighbors and government agencies to secure practices that would promote better air quality, such as requests to use fragrance-free laundry products and avoid using pesticides.

**How and Why Did These Healthy Residential Developments Continue?**

*Overall summary:* The continuation of these healthy residential developments, like their formation, was secured on funding, and one thing was clear: neither had a shortage of tenants seeking safe housing. Ecocase acquired several grants to make the needed repairs that it could not fund out of its existing budget. It was uncertain whether Greencase Rentals had enough funding to complete maintenance and repair projects, which could have meant creating vacancies to make needed upgrades to the buildings, such as by painting.

Another strong factor of continuation was property management. The basic methods and practices for property management at both communities has been essentially the same: using least-toxic products, providing adequate advanced notice before engaging

in activities that could lead to exposure, and working with tenants so that they can participate in finding solutions to management problems.

Ecocase's property managers ranged widely in their approaches, and one set a strong course for management, creating order by developing policies and practices that met the needs of the healthy residential development, guiding later managers to do better. The owner of Greencase was also exemplary, and managed multiple roles of founder, owner, manager, repairer, resident, and on-site call person. She eventually found that trying to be too accommodating to residents' needs could reduce the overall functioning and profitability of the Greencase.

Both healthy residential developments were threatened with public-use pesticide spraying: Ecocase to control the light brown apple moth, and Greencase to control mosquitoes. The threatened spraying for the moth was halted initially, but proponents believe that the fight is not yet over. Greencase's owner helped to get a pesticide notification system in place, which helps reduce exposure in the healthy residential development. Other threats from beyond the borders of the community have been negligible, though increasing traffic could become problematic.

These healthy residential developments continued because they had funding, were managed adequately, and were supported by commitments from individuals. Both healthy residential developments were locked into mortgages. The Ecocase mortgage requires tenants to have low incomes and be disabled, though it does not stipulate what disability they must have—only that the disability be a recognized one. Poor management or lack of interest could have derailed either healthy residential development. The owner of Greencase Rentals had difficulty covering her operating

costs, posted the motels for sale, and sold one of them. The owner's commitment to housing for individuals with MCS has restricted the pool of potential buyers to those who will continue to manage the property as a healthy residential development.

Table 4 displays the factors that contributed to the continuation of these two healthy residential developments. Primarily, their continuation is based on adequate funding and property management. Additionally, the determination of a few individuals who were very committed to healthy residential developments was influential. These individuals brought their knowledge of pollutant exposures and ways to reduce or eliminate them. They shared a firm belief that individuals with chemical sensitivities have a critical need for healthy residential developments.

**Table 4: Comparison of the Continuation of the Healthy Residential Developments**

| | Factor of Continuation | Ecocase | Greencase |
|---|---|---|---|
| How and why did each healthy residential development continue? | **Governance** | Board and by-laws. | Rentals owner. |
| | **Neighborhood Relations** | Asked neighbors for IPM and least-toxic laundry products. | Asked neighbors for advance warning of mosquito spraying. |
| | **Community Relations** | Ecology Group; Green Homes Tour participant. | Generally on friendly terms. |
| | **Government Relations** | Local government provided notice for roadwork. State pesticide use threatened against light brown apple moth, but was averted. | State public use of pesticides for mosquitoes. State's drinking water standard required chlorine, then allowed variance. |
| | **Funding** | Relies on federal rental subsidies and a zero interest loan. Major repairs used federal grants. | Greencase Rentals may not generate enough revenue to cover costs. Greencase Condos reduced turnover rates, stabilizing income. |
| | **Prospective Residents and Vacancies** | Long waiting list. Required trial stay. Federal preference for most needy prospective tenants suspended. | Many calls of inquiry. Initial short stay often followed by longer stays. |
| | | Both: Cleaning between tenants using baking soda, vinegar, and treatments with an ozone generator. | |
| | **Rules Governing Residents** | Lease agreements specify specific products that are allowed and rights and responsibilities for tenants and landlords. | |
| | **Resident Relations** | Safe socialization and empowerment for individuals with MCS. | |
| | | Some group meetings. | Some socializing; also some property damage and theft. |
| | **Residents' Abilities to Make Individual Adjustments to Units** | Residents used aluminum foil to seal vapors from living space and added water filters. | |
| | | Changes to the units must conform to rules. | Must obtain consent from owner. |

**Table 4 continued**

| How and why did each continue? | | | |
|---|---|---|---|
| | **Selection of Property Managers** | High turnover. Many managers not knowledgeable about exposure. Hired property-management corporation. | State Knowledgeable about exposures. Owner is manager who lives on site. |
| | **Property and Building Maintenance** | Both: Used principles of advanced notice. Used least-toxic products for cleaning and maintenance. Mixed results with shared laundry facilities. | |
| | **Property Management Decisions** | Varying interest and initiative among property managers. | On-site owner/manager was on call. |
| | **Major Repair and Renovation Decisions** | Additional grants to seal wallboard, using collaborative process. Turned airing room into storage space. | Greencase Some repairs unmade due to concern for causing exposures or lack of funds. |

**Internal Governance Structures**

Planning and decision-making within a healthy residential development is largely determined by internal governance structures. Because they are different types of housing institutions, Ecocase and Greencase differ considerably in their governance.

Ecocase, Inc. is a nonprofit apartment complex operated by a housing board and governed by its by-laws. The original board of Ecocase oversaw the construction and occupancy of the buildings, but some residents and EGP members felt that subsequent boards were unsympathetic to residents' concerns and focused exclusively on fiduciary responsibilities. After a series of problems and a succession of property managers, the board decided to hire Ascension, Inc., a property-management company.

Greencase began as a privately owned motel, half of which was sold and converted into condos. The owners of Greencase Rentals and Greencase Condos are both individuals who are committed to reducing pollutant exposure and making their

properties accessible to persons with MCS. Nothing legally binds them to continue to maintain their properties using practices that reduce pollutant exposure. They could decide to convert their property to conventional motels and condos or could sell their properties to someone else who would convert it.

Whereas the Ecocase is governed through a board of directors and by-laws, the owners of Greencase Rentals and Condos act as the sole directors of operations. Both the board of Ecocase and the owners at Greencase were committed to providing housing to individuals with MCS. Also, both the Ecocase board and the owner of Greencase Rentals have felt stressed from trying to manage the properties. At Ecocase, the situation resulted in poor relations with the residents and, eventually, the hiring of a property-management company, one with little interest in adapting its property management approach to people with MCS. At Greencase Rentals, the owner listed the property for sale, citing accommodating residents as a reason the business was not more profitable.

For the continuation of these healthy residential developments, resolving problems between the residents and the board or owners is important to successful governance. When the residents at Ecocase felt understood by the board, they also believed that an effort was being made to meet their needs to reduce pollutant exposure. At Greencase Rentals, the owner felt stressed in making extensive accommodations, and resolving problems with residents may have been easier had the owner not been working alone as an owner/manager and living on site without respite. In this sense, Ecocase has the advantage of multiple people sharing the burden to reduce pollutant exposure in all aspects of decision making for managing operations for the community.

**Neighborhood Relations**

The two healthy residential developments are located in neighborhoods with different characteristics, which accounts for some differences in their relationships in their neighborhoods. Ecocase is in a dense residential area and needs to reach out to neighbors to secure their cooperation in reducing exposure. Their efforts, such as securing notification for pesticide use, painting, or construction, were made by a former property manager, Frank, or by particular residents acting on their own, and were not usually led by the board. The effectiveness of these efforts often depended on the receptiveness of others. For example, Frank discovered that the neighboring property manager was already very familiar with the idea of reducing pollutant exposure because he had a family member with chemical sensitivities; thus, he was willing to make efforts beyond what Frank requested of him. In contrast, in talking to the builder and the owner about potentially polluting activities during construction next door, Frank found them unreceptive.

At Greencase, the owner asked friends at motels up the street to call when the pesticide-spraying trucks were approaching. Because Greencase is in a windier and less dense area than Ecocase and has less polluted ambient air, it may be less affected by neighbors' polluting activities. This points to the importance of the site chosen for a healthy residential development.

Neighbors can facilitate the goals of a healthy residential development by agreeing to restrict certain activities on their own properties, such as the use of pesticides and fragranced laundry products, but also by activities involved in new construction and renovations. Conversely, neighbors can impede the goals of a healthy residential

development if they do not cooperate with requests to prevent pollution or if they become vindictive, purposely acting in the ways they were told are harmful.

The impact of neighborhood relations depends both on the neighbor and on the approach used by the healthy residential development to request participation. Some communication approaches and personalities may be more effective than others. For example, individuals with MCS may choose to personally purchase and supply their neighbors with safer laundry products to elicit their cooperation and to ease the burden on the neighbors. Individuals often negotiate with their neighbors because it is less expensive than moving, and they feel they are unlikely to find a safe house in a healthier community if they did move.

**Community Relations, Outreach Activities, and Publicity**

The continuation of healthy residential developments is facilitated by good public relations and outreach activities. The EGP was instrumental in founding Ecocase and continues to play an important part in its survival. Although some individuals in the EGP wished to encourage more community outreach, the board of Ecocase has shied away from an activist role, and is focused more on financial management. Nevertheless, many of the residents at the Ecocase are also members of the EGP and participate in their monthly meetings, support groups, and local efforts to promote practical environmental solutions. Ecocase was able to showcase its strengths and opened to the public as the only multifamily-housing participant in a green-homes tour.

At Greencase Rentals, the owner was involved in some community activities, such as community meetings for environmental causes, but had not initiated community-

outreach activities perhaps because of the tourist orientation of the local business community and the intense demands as an owner and on-site manager.

**Government Relations and Planning Issues**

Because government policies and planning can affect the pollutant exposure in a healthy residential development, efforts made by people at Ecocase and Greencase to improve practices were important to their continuation. Ecocase benefited from its location. Both the city and county were wealthy and focused on sustainability and progressive social issues. Local government ordinances promoted green building, waste reduction, and indoor and outdoor air quality. The locality also has citizen councils to advise government agencies in a way that is intended to make planning processes more democratic and transparent. Ecocase property managers, residents, and members of the EGP were able to get involved in city and county activities, including the development of an Integrated Pesticide Management ordinance. At the request of the property manager, local departments and agencies agreed to provide notice before potentially polluting activities, such as when roads were paved, curbs painted, or pesticides were to be sprayed, but these arrangements failed as subsequent property managers did not pass the notice on to residents or allowed the relationship to the notifying agency to slip away. This experience leads to an important lesson. Not only does it take effort to initiate the relationship between the healthy residential development and a government agency, it also takes effort to maintain such relationships. The relationship must be institutionalized so that its continuation outlasts any given person in the office of a government agency or property-management firm.

A former property manager at Ecocase wrote an emergency-procedures manual for all Ascension Services properties that included reducing pollutant exposures, particularly for Ecocase. That property manager also trained several policemen in dealing with individuals with MCS. In this way, a single individual planned for emergencies. Very little work has been done on how to accommodate individuals with MCS in the event of an emergency, so this effort was unique.

The same property manager contacted a representative at HUD to relate the successes that Ecocase had achieved. The results of this kind of conversation are sometimes never known, but it may help in the future, should there be a challenge, problem, or opportunity for support.

Both communities made progress around another major concern: pesticide exposure. Both healthy residential developments contacted city and county officials and government branches to try to affect policies on pesticide use. The actions of at least one property manager for Ecocase and the voluntary activities of some residents and a host of allies, including those from the EGP, facilitated the continuation of the Ecocase by supporting efforts to reduce potential pesticide exposure. The City of Nadal made changes immediately to accommodate the requests of the Ecocase property manager, but formal policies at the county level involved a struggle. The IPM ordinance of Ariel County was among the first in the nation, modeled after the one in Norcal. The Greencase owner was not as successful in changing Clerk County's pesticide-use policy, though it succeeded in securing a low level of advanced notification.

While public-use pesticide spraying could dramatically affect the continuation of a healthy residential development, it appears to have had only moderate impacts on either

community to date. It is possible that some viewed Greencase as being in an area where pesticide spraying occurs, and this reputation may have prevented some individuals with chemical sensitivity from choosing to go there at some point in time. While no place may be perfect, people who are chemically sensitive are understandably cautious, and may prefer to hold on to a current residence that is somewhat safe in a known way rather than risk going someplace that may be unsafe in new or unknown ways.

State regulations affected Greencase Rentals when the owner wanted to supply the units with nonchlorinated water. The Greencase became a test site for nonchlorinated water treatment when a new inspector took personal initiative with a legislator on behalf of Greencase.

These examples from Ecocase and Greencase focus on the efforts made by property managers, residents, and associated activists to make amendments to existing laws and practices. Some of these changes required only a polite request from a property manager, such as when the Ecocase requested notification about roadwork. Other changes have required a concerted effort of individuals and environmental organizations to bring about less-polluting practices. An example of that is when residents of Ecocase, EGP and others worked with the city, county, and state to obtain changes in pesticide policies.

**Funding Operations, Maintenance, and Renovation**

After the initial funding for the design and construction of Ecocase and the purchase and renovation of Greencase, additional funding was necessary for the continuation and repair of each property. Rental income may not suffice to maintain a healthy residential development. Funding becomes an ongoing issue.

When Ecocase was ready to complete renovations, sealing the wallboards and removing and replacing the fixtures that used baked-on enamel, they needed outside funding, partly because they had not yet built up financial reserves. Additional funding was secured from two CDBG grants, thus facilitating the continuation of Ecocase. After a series of managers, Ecocase acquired a property manager who attended to the pollutant exposure concerns of the residents, going to great lengths to keep to a budget. At Greencase, owners probably used profits from other business ventures to invest in their healthy residential developments. Both developments saved some money by completing many repairs themselves.

At these two healthy residential developments, repairs that reduced pollutant exposures sometimes required a temporary vacancy for the safety of the residents. At Ecocase, arrangements were made for long-term residents to stay in the Community Room for a short time while a repair outgassed or hardened. At Greencase Rentals, making repairs often meant sacrificing rental income.

Should a housing unit become unfit for habitation by a chemically sensitive individual, the owners may not be able to rent it at all. Both communities have had units they were not able to rent due to the perception that the unit was contaminated. Neither healthy residential development has insurance to cover contamination that would cover the loss of rental income from units that become unfit for chemically sensitive individuals. Ecocase and Greencase Rentals will withhold portions of the deposit to cover remediation of damaged units. At both places, the total deposit does not always cover the cost of repair and remediation, and owners or managers suffer a loss both in the costs of reparations and in the loss of rental income while repairs are made.

A potential problem for continuation relates to the possibility of providing a different kind of housing. Ecocase receives significant federal funding to provide housing for low-income individuals with disabilities. Because the requirements do not specify the type of disability, the board has the option to change the by-laws to rent to individuals with other types of disabilities. While the likelihood of this change is low, the implications are high. Residents feel insecure in their housing, and have become reticent in communicating problems to the board, lest the board view people with MCS as too difficult to accommodate. Greencase Rentals and Condos residents are dependent on the owners and their desire to continue to maintain the development for people with MCS. They can change their focus anytime.

**Prospective Residents and Vacancies**

Prospective residents at Ecocase and Greencase must fulfill several requirements. Residents at Ecocase must have a doctor's certification of being disabled by MCS and be very low-income for that area. Guests at Greencase must be able to pay market rent. The demand for prospective vacancies at Ecocase was so high that the Waiting List was capped at 100 individuals. This response indicates a need for low-income housing for individuals with MCS. Ecocase's experience of using a Waiting List follows HUD regulations and may be consistent with housing programs that target homeless individuals.

Vacancies at Ecocase are filled after individuals on the Wait List are contacted, respond, complete an interview, arrange and complete a mandatory 48-hour trial stay to confirm the unit's suitability, and sign the lease, a process that takes more time compared to the area's much faster rental rate. This process is made lengthy by the transience of

the population in demand for the vacancies, the need they have for a trial stay, and the time it takes for individuals to plan and complete a trial stay, especially if they do not live locally. The willingness of prospective tenants to go to great lengths to plan a trial stay attests to the need for this type of housing.

Property managers at both developments clean with vinegar and baking soda and ozone treatments. One Ecocase property manager took at least three weeks to prepare a unit, and the Greencase owner typically had a few days to prepare a unit for the next motel guest, taking a minimum of 8 hours. This basic cleaning does not address repairs, which, as discussed earlier, also involve allowing time for materials such as paint to outgas before either a trial stay or a new resident can take over the unit.

The 48-hour trial stay required before signing a lease at Ecocase is comparable to the initial stays of guests at Greencase. Many chose a short initial stay as a trial period before returning to rent for longer periods. These trial stays allowed renters to judge the suitability of the units in a situation comparable to a long-term rental experience. At Ecocase, HUD can provide a small rental subsidy while an apartment is empty, but it does not make up for the lost rental income. Greencase Rentals offered minimum one-week stays, but the cost of cleaning between renters was high, requiring at least a day or longer. For financial viability, these developments need to keep units occupied. Funding must be planned to support extensive cleaning and several trial stays per vacancy.

The owner of Greencase Rentals screened callers for their ability to live independently and for their attitudes or personalities, after having negatives experiences. Prospective renters were screened to ensure the owner would be able to manage the

property more comfortably. The difficulties involved in management and accommodation were discouraging for the owner.

Neither healthy residential development has had any trouble attracting residents. Both are now listed in MCS travel directories or mentioned in publications, which recommend these developments as places to live or stay. Both communities found that word of mouth is an effective advertising method. Becoming recognized as places that can accommodate individuals with MCS facilitates their continuation.

**Rules Governing Residents**

Both healthy residential developments have rules that specify behaviors intended to reduce or eliminate pollutant exposure. These rules are addenda to the lease agreement and are ultimately enforceable through local eviction practices and procedures. At Ecocase, residents are responsible for ensuring their guests follow the rules, and the property manager is responsible for enforcing them for everyone. Residents at Ecocase have had to train property managers to understand and follow the rules. Ecocase residents report that the rules are most often broken, not by residents, but by property managers, board members, and their guests, such as vendors.

The rules governing residents are intended to reduce personal exposures for everyone, and also to ensure the health, safety, and comfort of all the residents. At both healthy residential developments, the rules seem to work and are enforced by warnings, education, and ultimately the threat that a tenant's lease will be terminated. A primary reason why the rules work in both places is not that the rules are clearly stipulated or consistently enforced nor that the punishment is severe, but rather that the residents respect others' needs for a safe living environment, free from unexpected assaults from

pollutants. Residents have a basic understanding that other residents have a strong need for safe housing, and no one wants to jeopardize anyone else's health and safety. For this reason, chemically sensitive residents are far less likely than other groups, such as property managers, owners, or visitors, to violate rules involving pollutant exposure.

Guests of tenants at Ecocase or Greencase are expected to follow all the rules, and tenants are responsible for the behavior of their guests. The property manager is responsible for enforcement. The rules that govern the residents are essential to the continuation of healthy residential developments. If the property becomes contaminated by pollutants on a temporary or permanent basis, then the housing may be compromised and could cause pollutant exposures or require that a unit be left vacant: individuals with MCS could no longer live there.

**Resident Relations**

Individuals with MCS are often socially isolated because they are unable to tolerate pollutant exposures that occur when being around polluting people. Living in healthy residential developments can provide them with an opportunity to participate in social events. Because their illness was understood by their neighbors and landlords, residents at both healthy residential developments felt empowered and supported in their desire to reduce their pollutant exposure. While some residents did not get along with others, many people at both developments developed friendships. Although the Resident Council was not effective at Ecocase, the EGP planned many social activities that brought other individuals to Ecocase who also were conscious of preventing pollutant exposure for others.

The ability of individuals with MCS to be harmed by another person's actions is given by some individuals with MCS as a reason to not form healthy residential developments that segregate individuals with MCS. However, in both these healthy residential developments, residents exhibited trust and respect for one another.

Positive resident relations led to the prominent strength of compassion. Despite differences among personalities, residents looked out for each other and took a compassionate stance toward each other. Also at Ecocase, good resident relations enabled residents to send a letter to the board that was signed by every resident. At Greencase Rentals and Greencase Condos, good resident relations led to compassionate support for others. Residents provided extra blankets to arriving guests and helped each other in many ways. People in healthy residential developments need to feel their surroundings are safe physically, in having eliminated pollutant exposure, and in having emotionally peaceful spaces.

**Resident's Abilities to Make Individual Adjustments to Units**

Most residents at both healthy residential developments changed their units in minor ways, such as by placing thick aluminum foil to seal chemical vapors from their living spaces (especially in closets) or installing additional water filters for drinking or showering. Changes in any unit at Ecocase must conform to rules designed to protect the integrity of the building. Changes at Greencase needed to be approved by the owner. The ability of residents to inadvertently damage the interior of a unit suggests the need for guidelines and oversight for allowable changes that can protect the integrity of the building.

**The Selection of Property Managers**

A key component of property management for both healthy residential developments is a sense of trust between property managers and residents, acting together to prevent pollutant exposures. This coordination of efforts helps a healthy residential development continue. In addition, managers must have good interpersonal skills to set the tone and create mutual understanding for expectations.

Initially at Ecocase, board members tried to act as property managers. With all the demands made on them, the board soon moved to hire a property manager. One of the early property managers did not consider his primary task to be reducing exposures for residents and did not understand how to accommodate residents. A highly competent property manager was hired with good people skills as well as a commitment to accommodation of people with chemical sensitivities. This manager took a personal interest in reducing pollutant exposures at Ecocase and beyond, through involvement in environmental and public health issues. The manager's ability to learn on the job, devise new methods for solving problems, and keep records of acceptable practices and vendors willing to comply with Ecocase house rules had a meaningful impact. The board later moved to hire a large and expanding property management company, and results were mixed. The company did not have as much interest in property management for healthy residential developments, and the former and successful property manager became stressed by new inefficient practices and left. That manager was succeeded by others who did not comprehend their roles in reducing pollutant exposures and were not as competent in dealing with residents' needs. For this role, successors were trained by residents.

The owners of Greencase Rentals and Greencase Condos are property managers who live on site and have at times hired assistants. All of them have experience making necessary accommodation for people. They have established high standards for themselves and diligently work to provide chemically safe housing for residents and guests. Residents and guests at Greencase developments praised the owners and the way the properties were managed.

Both developments were established to maintain environmentally healthy housing. However, Ecocase, run variously through the board, property managers, and a property-management company, discovered that property management at a healthy residential development requires additional skills, such as researching ways to reduce pollutant exposures, and consulting with residents on the suitability of products. The owners of Greencase shouldered these responsibilities independently.

**Property and Building Maintenance**

A healthy residential development needs minor repairs and routine maintenance that reduce or eliminate pollutant exposure for residents. The design and construction initiated preparation for a healthy residential development, but continued performance depends on what happens on the property day by day. The property manager, residents, and workers each have a role. The following examples illustrate the importance and influence of these roles, especially that of the property manager.

At Ecocase, one property manager ensured that some problems, such as the repair of door locks, were fixed immediately by a professional trained to arrive at Ecocase fragrance-free. This immediate attention to problems built a sense of trust among residents for the property manager. They knew they could count on the manager to pay

attention to their problems and take their concerns seriously about reducing pollutant exposure.

At Ecocase, repair of a light fixture using a toxic product led to the permanent contamination of the Community Room for some individuals who found the room less tolerable due to pollutant exposure. Thus, a repair can permanently contaminate a room if the toxic product that was used does not outgas completely. The property manager needs to be familiar with the materials being used and know what pollutant exposure they can cause.

At Ecocase, a manager provided one-month notice before touch-up painting in shared spaces. Advanced notice for repairs allows residents and frequent visitors enough time to respond by arranging appropriate actions to reduce pollutant exposure. They also may wish to ask questions about materials or methods to ensure that they can avoid pollutant exposure. Advanced notice also provides enough time for this dialogue to occur.

Ecocase property manager researched water-filter operation and selected options that were more preventative in reducing potential pollutant exposure, even though those choices raised costs. At Greencase, the decision to use gas-powered equipment was done in conjunction with advanced notice to residents so they could prevent pollutant exposures. Property managers at both developments never used any toxic pesticides inside the units.

Both healthy residential developments have shared, coin-operated laundry machines, which restricted individuals' use of laundry products and led to contamination of some clothes if the load followed that of someone washing clothes that had been

exposed to some pollutants. Shared laundry facilities are workable, provided rules are in place to restrict laundry products to those that prevent pollutant exposures, though personal units are preferable.

At these healthy residential developments, property managers used their discretion to determine lawn-care practices, pest-management approaches, repair and maintenance methods, and water-filtration methods. Over time, a property manager becomes more knowledgeable about how systems work and what applications are appropriate on site. Better practices are sometimes established through trial and error. To be effective, property managers must build trust among residents so that the residents feel comfortable reporting problems in their units and in the building. If the residents do not report problems, then the problems can go unaddressed and worsen. Given the importance of the day-to-day operations in reducing pollutant exposures, the selection of the property manager is critical to ensure that the person can do the research to select appropriate materials and methods and be willing to work closely with residents.

**Property Management Decisions**

Property managers at healthy residential developments have the responsibility to work out solutions that reduce or eliminate pollutant exposure for residents. If there are not procedures in place for any particular situation, the safety of the building and its residents depends on the decisions the property manager makes.

One property manager at Ecocase took the initiative to create procedures and specific written protocols to describe property management practices, such as providing advanced notice for prospective repairs, interviewing prospective tenants, dealing with conflicts between tenants, guiding visitors in proper behaviors to prevent pollutant

exposure, and providing information for vendors and contractors coming to Ecocase to do work. This property manager had a method for keeping records of vendors' work and documenting repairs to each unit, including the materials, products, and practices that were used. The procedures and protocols developed at Ecocase guided property management toward fair and just practices to reduce pollutant exposures. Residents, the property manager, vendors, and visitors each knew what was expected of them in normal circumstances and when there were problems. The system of documenting repair work meant that, at some future time, the record could be referenced in making decisions.

Some of the property managers at both healthy residential developments have trained workers to arrive fragrance-free and to perform property management in a way that reduces pollutant exposures. If they see it as part of their job, property managers can train workers to arrive fragrance-free and to do work that reduces exposures, but they must be vigilant in providing oversight to prevent mistakes in adhering to their preferences.

At each healthy residential development, property managers were faced with making decisions to solve problems while preventing pollutant exposures. Some problems that occurred were new, and the property manager could not refer to a prior solution. Thus, willingness to learn is a vital component of the job. An ideal property manager would have a true commitment to reducing pollutant exposures and would be able to recognize opportunities to reduce potential pollutant exposures in the absence of problems, as was done with the installation of the community drinking-water filter and the design of protocols for use in property management. The oversight and support for

the property managers' tasks in reducing pollutant exposure is important to ensure that future property management decisions continue to reduce exposure.

**Major Repair and Renovation Decisions**

In order to maintain property at a healthy residential development, property managers have to engage in a process of negotiation with residents to protect them from pollutants during changes. At Ecocase, the sealing of the wallboard illustrates how a property manager and residents can collaborate to choose materials and schedule the logistics of leaving their apartments while major repairs are made. The process by which the property manager created storage space in the Airing Room also illustrates a collaboration that made the residents participants in solving their own problems. The process enabled a broad consideration of several difficulties with the Airing Room, such as cleaning the room, rethinking the use of the room, and creating a forum for the residents to cull their storage items. Officially allowing storage also meant establishing rules for the use of the storage space and using a fair process to achieve it. This points out the necessity for including residents in decisions that involve them.

At Greencase, several anticipated major repairs have been stymied by trying to balance keeping units available for guests and protected them from pollutants. The owner felt discouraged about the inability to make some repairs; for example, low-VOC paints would not hold up at the coastal location. At Greencase Condos, the owner involves residents in selecting paint and gives them ample notice before painting.

Ultimately, each manager must prioritize repairs and renovations with consideration for residents' abilities to withstand the potential pollutant exposures resulting from the projects. Working with the residents to provide solutions to problems

has had favorable results. This again illustrates how the property manager or owner can be a major factor in the continuation of a healthy residential development.

## Analysis of Regulations and Policies that Influenced the Factors of Formation and Continuation of Healthy Residential Developments

Government regulations and policies both facilitated and impeded the formation and continuation of healthy residential developments. These included federal and state regulations, especially lease agreements, local codes, and ordinances, particularly with respect to pesticide use and land-use policies (see Table 5).

**Table 5: Comparative Analysis of Implementation Methods**

| Type | Considerations | Ecocase | Greencase |
|---|---|---|---|
| **Government Regulations and Policies** | **Environmental and Public Health Regulations** | E(-): Water quality laws led to the supply of chlorinated and fluoridated water. On-site filtration needed. | G(-): Law forced G. to add chlorine to its on-site well water, which it then removed for on-site use.<br>G(+): New law allowed G. to become the state's first commercial test site for chlorine-free drinking water disinfection. |
| | **Landlord-tenant Laws** | B(+): Lease agreements were used to prescribe practices and products to be used by the landlords, property managers, and tenants, but their enforcement was cumbersome. | |
| | **Pesticide Regulations** | B(+/-): Federal law requires pesticides to be registered and environmental impact assessments to be conducted before their use, but these protections were inadequate. | |
| | | E(-): State got federal exemption to spray an unregistered pesticide, though public outcry stopped the action before spraying occurred at E.<br>E(+): City and county had Integrated Pesticide Management policies that considered the prevention of pesticide exposure. | G(-): G. suffered from exposure to public spraying.<br>G(+): G. owner influenced adoption of a notification policy. |

**Table 5 continued**

| | | | |
|---|---|---|---|
| | | B(+): Codes create some separation of land uses, reducing some pollutant exposures, such as by placing some polluting industries at a distance and creating nearby parks and protected areas. | |
| | **Codes, Zoning, & Land-use Policies** | E(-): County development codes such as slow-growth restrictions and exclusionary zoning impeded siting of their multifamily development in low-density areas.<br><br>E(+): Inclusionary zoning made site selection possible.<br><br>E(-): Zoning laws precluded the design of small, detached cottages. | G(-): Land-use policy requiring special permits for hospitals led to an ordered stoppage of work during the formation of G. |
| | **Government Expenditures & Financial Incentives** | E(+/-): E. received HUD CDBGs, HUD Section 811 program funds, and HUD HOME Partnership funds, as well as a county housing trust grant, for construction. HUD funding requirements made site selection difficult.<br><br>E(+): E. Received additional CDBGs for renovations. | G(+): N/A. |

**Table 5 continued**

| | | | |
|---|---|---|---|
| **Beyond Government** | **Markets** | E(+): E. received an interest-free, 30-year mortgage. | G(+): G. secured a conventional commercial mortgage. |
| | **Civic Associations** | E(+): 3 of 9 funding sources for formation were from local, nongovernmental, nonprofit organizations.<br><br>E(+): Three nonprofit organizations collaborated in foundational effort.<br><br>E(+): MCS advocacy group led purposeful effort to create the E., to support residents and others, and to be active in grassroots efforts to reduce pollutant exposures. | G(+): Owner involved in local activism. |
| | **Individuals** | B(+): Highly motivated, self-determined individuals were instrumental in making innovative and purposeful choices to create and sustain these developments. They volunteered their time.<br><br>B(+): Residents formed communities of culture that were knowledgeable and vigilant about pollutant exposure on-site. Broader communities of culture stopped pesticide spraying by the state. | |
| | **Broader Connections** | E(-): Proposed state pesticide spraying threatened E. | G(-): Owner sought changes in the state's pesticide policies; special committee was formed; no changes were made. |

*Note.* (+) indicates that a consideration facilitated formation or continuation, (-) indicates that a consideration impeded formation or continuation, and E, G, and B indicate that the considerations affected Ecocase, Greencase, or both cases.

### Environmental and Public-Health Regulations

Both healthy residential developments were affected by environmental regulations, such as water-quality standards. At Ecocase, municipal water supplies had many pollutants, notably chlorine that had to be filtered out with the installation and use of a whole-building filter and a reverse-osmosis filter at extra cost for purchase, installation, and maintenance. At Greencase, state drinking-water regulations required that chlorine be added to the drinking water in each of four wells in order to meet the chlorine-based safety standard. It was an extra expense to purchase, manually add, and then filter out the chlorine, as well as other impurities. Years later, a new inspector had connections that led Greencase to become the state's first commercial test site for a nonchlorine-based system of disinfection. Additionally, some residents purchased water from other sources and installed additional faucet filters.

### Landlord–Tenant Laws

For both healthy residential developments, lease agreements facilitated their implementation by prescribing practices and products to be used by the landlords, property managers, tenants, and visitors. An addendum to the lease agreement specified the allowable or required practices and products that were intended to reduce pollutant exposures.

In this study, residents were motivated to keep their safe housing despite problems with owners and managers; owners and managers continued to maintain their properties for people with MCS, despite challenges with residents. These landlord–tenant disputes affected the healthy residential developments socially, economically, and environmentally in ways that both jeopardized and strengthened their formation and

continuation. In several of these instances, challenges led to better management practices. In other instances, stresses drained the energy and resources of the owners, the board, and the property managers. But overall, people stayed committed to the healthy residential developments.

**Pesticide Regulations**

Pesticides are highly regulated. To some extent, this regulation was helpful to the healthy residential developments, but it was inadequate to meet the needs of people with MCS.

Ecocase was and continues to be threatened with aerial spraying by the state for the control of the light brown apple moth population. Despite local governments' adoption of stricter standards for pesticide regulation, the California Department of Food and Agriculture initiated spraying in other areas of the state, initially using a federal exemption to avoid having to register the pesticide and complete an environmental impact report, as required by state and federal law. Public outcry over reports of human health effects and bird deaths led to a temporary injunction.

For Ecocase, the local city and county had policies to support IPM, which reduced exposures for residents, thus supporting Ecocase's continuation. For example, the local recreational center and park had pesticide-free and fragrance-free policies that created accessibility for some residents. Residents and EGP policies helped put these policies in place.

Federal, state, and local regulations of pesticides affected the healthy residential developments. The public use of pesticides for mosquito control impeded Greencase Rentals by causing exposures on several occasions. The Greencase owner promoted

stronger restrictions at the state level, but was impeded in getting an integrated pest-management policy that could have done more to prevent exposures. A state pesticide-notification system for public-use spraying was enacted, partly due to the owner's effort, supporting the continuation of Greencase.

**Codes, Zoning, and Land Use Policies**

The Ecocase had difficulties selecting a site. County development codes both impeded and facilitated site selection. Preferred land parcels for sale had the best outdoor air quality, but these were generally located in low-density areas where multifamily housing was impeded by exclusionary zoning, and by slow-growth restrictions intended to reduce negative impacts from unrestricted residential development. Most available properties zoned for multifamily housing were in areas with poor outdoor air quality due to high-density use and roads. In addition to chemical exposures, Ecocase site selectors tried to avoid exposures to electromagnetic frequencies from high-tension wires. The final site was a compromise, being near to high-tension wires in a higher density area and close to major roads.

Ecocase was finally sited in part due to inclusionary zoning. A developer intended to build new, market-rate, for-profit housing on a piece of land that he owned and did not have listed for sale. By selling part of his land to Ecocase to develop into low-income, nonprofit housing, the developer was able to develop the rest of his original land parcel at considerable profit.

Zoning laws precluded the ideal design for Ecocase of small-detached cottages; a design compromise created three separate building structures, one of which contained enclosed garbage facilities. A land-use policy affecting the permitting and siting of

hospitals led to a government attempt to shut down Greencase during its formation. Once its purpose was clarified as a motel, not a healthcare provider, it was allowed to continue renovations.

**Government Expenditures and Financial Incentives**

Ecocase, Inc. started with a $5,000 CDBG grant from the county, which they used to create a formal proposal for Section 811 HUD funding that supplied both an interest-free, 30-year mortgage and on-going rental subsidies. This funding had two requirements for site selection that affected formation. One requirement was to be near a bus line, and the other was to have a low slope to accommodate people in wheel chairs. These requirements prevented Ecocase from selecting a site that had better ambient air quality.

While the Section 811 funding was and continues to be critical to formation and continuation of Ecocase, one funding requirement—that the building remain available to very low-income, disabled tenants— leads to a tension that could potentially impede continuation. Because the funding does not stipulate what disability the tenants must have, the Ecocase board may choose to change its by-laws to rent to tenants with disabilities other than those with MCS. This possibility was raised repeatedly in housing board meetings, and worries some tenants.

**Beyond Government: Markets, Civic Associations, Individuals, and Connections**

Methods used to form and continue these healthy residential developments went beyond government actions. Market structures, civic associations, individuals, and broader connections also led to the formation and continuation of the two healthy residential developments.

Stable economic markets made it possible for Ecocase to acquire an interest-free, 30-year mortgage and for Greencase to secure a conventional commercial mortgage. The existence of supportive civic institutions enable the vision, involvement, experience, and funding to form and sustain Ecocase.

At Ecocase, there were low-income housing advocates, such as Ecocase cofounders Kirkman, the cofounder and president of the EGP, and Nettleton, the first Board President, who coordinated the volunteers that successfully formed Ecocase. Lippard, a housing specialist, was instrumental in securing funding for formation, selecting a site, and counseling the first residents. Frank was a model property manager for individuals with MCS, and several interviewees credited Frank for saving Ecocase from collapse. Several Ecocase residents and members of EGP were devoted to the success of Ecocase, such as Brenda Starr, Lucy Mahar, and Gina Norman. At Greencase, owner Conrad has "poured her heart and soul" into the business, a pillar of strength in a challenging business for which the owner holds sole responsibility. Martelli has long been in the landlord business, and has been unwavering in a vision for using healthy building methods.

Additionally, both healthy residential developments owe their formation and continuation to individuals who lived in or near the healthy residential developments and supported them. These individuals formed communities of culture that were knowledgeable about pollutant exposure, their health effects, and ways to reduce exposure.

## Conclusion

The premise for the healthy residential development is that a house-by-house approach is not enough to protect vulnerable individuals from pollutant exposures because a vulnerable individual can be affected by the actions of neighbors, other people and businesses, and government agencies. This study reinforces that premise. These healthy residential developments protected residents from some pollutant exposures, but not all, such as from laundry products and pesticide use.

The analysis highlighted activities the people in these healthy residential chose for engagement and examined whether those activities were within or beyond the immediate governance of the healthy residential development. For example, activities by the healthy residential developments that went beyond their immediate boundaries were discussed within specific factors of formation or continuation, such as neighborhood relations, community relations, and government relations, and, additionally, by specifying activities that occurred at national, state, and local levels, from attempting to limit pesticide use by the state to encouraging neighbors to use fragrance-free products.

Within the healthy residential developments, activities that were intended to reduce pollutant exposures included the choice of building design and materials, the option for a trial stay to determine suitability, and the lease agreements that specified the use of least toxic products and practices, thus meeting the residents' needs to avoid pollutant exposures related to building materials, laundry products, pest control, and personal care. These activities were not enough, though. Preventing pollutant exposures within these healthy residential developments led various people to work outside the development to prevent exposures. These actions, which were largely within their own

neighborhoods, cities, and counties, were largely intended to prevent exposures to pesticides and laundry products. Additionally, people at both cases took action at the state level, such as Ecocase's efforts to avoid pesticide exposures from a statewide moth control program and Greencase's exemption from adding chlorine to its onsite wells to meet state standards for water disinfection.

Some interviewees argued that healthy residential developments should take a stronger role in standing up for their interests at scales beyond the healthy residential development. Indeed, both developments arose from an activist orientation for environmental health. This concept and vision was at the heart of the Ecocase founders and the Greencase owners. While their vision did not necessarily see what would actually unfold, the founders nonetheless stayed committed to the broader goals and the immediate need to house people with MCS. Nevertheless, these cases suggest limits for what healthy residential developments can reasonably be expected to do, as well as modifications to codes, standards, and regulations that can protect human health both within and beyond a residential development.

This chapter analyzed the formation and continuation of the case studies, after previous chapters presented data based on original interviews. Chapter 8 concludes by revisiting the purpose of the study, its findings and contributions, and suggesting strengths and limitations, implications, and future research.

# CHAPTER 8: CONCLUSIONS

Healthy residential developments are needed to reduce exposures to pollutants. Chapter 2 presented the need for primary and secondary prevention of multiple chemical sensitivities by examining the needs of chemically sensitive individuals for healthy residential developments. Chapter 3 explained the selection of cases of healthy residential developments for study and the methods used to examine them. In Chapters 4–7, studies of two exemplar cases examined how and why healthy residential developments were able to form and continue.

In this chapter, the first section summarizes major points in the dissertation and revisits the primary findings. The second and third sections consider the implications for planning and the strengths and limitations of the case studies. The fourth and final section proposes future research and concludes.

## Executive Summary and Primary Findings

This empirical research investigated the question: **How and why do healthy residential developments form and continue?** In so doing, it examined their implementation methods and their implications for planning and policy.

This dissertation research is based on empirical data being reported for the first time from multiple sources. Two site visits led to a total of 66 original interviews, which were partially reported in Chapters 5 and 6.

### What is the Definition of Healthy Residential Developments? (Chapters 1 and 3)

This research proposed a stipulatory definition of healthy residential developments to address the problem of pollutant exposures that cannot be solved with a

house-by-house approach. Healthy residential developments use a broader approach to reduce pollutant exposures to the extent required by vulnerable populations. Healthy residential developments complement and contribute to similar concepts of sustainable communities and ecological communities, especially concepts in the literature and programmatic initiatives for healthy homes, healthy communities, healthy cities, and healthy places. For research purposes, an additional level of stipulation was added to the definition of healthy residential developments. The vulnerable populations were delimited to populations of individuals with MCS.

**What is the Need for Healthy Residential Developments? (Chapter 2)**

Sources of exposures to toxic pollutants are common in housing and in residential developments, and can make these places unsafe. Widespread human exposures to toxic pollutants are a major contributor of disease. The relationships between exposures and effects are complex, including cumulative, synergistic, and intergenerational effects. Very low-level exposures to chemical pollutants can have profound and irreversible adverse health effects. Everyone is sensitive to pollutant exposures to some degree, but some groups are especially sensitive, such as pregnant women, unborn fetuses, newborn babies, young children, people with weakened immune systems, and people with asthma or chemical sensitivities.

Individuals with MCS represent a critical case of the need for healthy housing and healthy residential developments, because they require them to participate in society, especially to access housing, employment, and most services. Reviews of prior case studies of the coping experiences of sensitive people highlighted many of the major personal impacts of unsafe communities, such as living in unsafe homes that make

residents sick, being transient or becoming homeless, and not being able to participate socially and economically in society, such as difficulty shopping, having to quit a job, being unable to walk in neighborhoods, being unable to visit family, being unable to go to schools for education or events, having to quit hobbies, and generally getting sick from being in places most people go every day. MCS is a devastating and debilitating illness that can be prevented and accommodated by reducing everyday toxic exposures in housing and communities.

Chemically sensitive individuals can inform the critical toxic exposures that could be reduced in healthy residential developments. The experiences of individuals with MCS demonstrate that there are some relatively simple ways to reduce exposures to chemical pollutants and create healthy residential developments, such as opening windows to create ventilation and using baking soda to clean.

**What is the Role of Planning for Healthy Residential Developments? (Chapter 2)**

Planners are in a unique position to address the need for broad-based, community-level approaches to solve problems of unsafe housing and unsafe residential developments due to everyday toxic exposures. Planners can prevent potentially harmful exposures for the general public, lift barriers to healthy housing, and implement strategies that can accommodate individuals disabled with chemical sensitivities.

Federal laws and reports and ethical concerns about toxic exposures demand attention from planners, particularly the American with Disabilities Act that requires "reasonable accommodation" for disabled individuals.

**Which Healthy Residential Developments Should Be Studied and Why? (Chapters 3 and 4)**

Although many cities, counties, and intentional communities are implementing environmentally conscious practices to manage pollutant exposures, none were going so far as to reduce low-level exposures to the extent required to meet the needs of individuals who are exceptionally vulnerable to pollutant exposures. For this study, the cases were healthy residential developments that reduced or eliminated critical toxic exposures, including low-level exposures, based on the needs of people with MCS. The healthy residential developments in this study were critical cases that influenced the development of knowledge of how to reduce pollutant exposures; they were extreme cases that could provide such information more than other healthy residential developments; and they were exemplar cases intended as prototypes to future healthy residential developments; thus, they create a paradigmatic standard for the reduction of pollutant exposures.

Ecocase and Greencase each have 11 rental units. Ecocase is a private, nonprofit organization run by a board and governed by by-laws. It provides multifamily housing to low-income individuals disabled by MCS, and for that received HUD funds for development, renovation, and rental subsidies. Greencase was begun by an independent businesswoman who purchased and renovated two existing, adjacent motels. Greencase Rentals are priced at market rate. Both communities provide whole-building water filtration to reduce chlorine exposures. Both are located near major bodies of water as a way to increase passive ventilation and access to cleaner air.

**How and Why Do Healthy Residential Developments Form? (Chapters 5 and 7)**

The explanation of how and why the two healthy residential developments formed was explained though six thematic factors investigated: vision and involvement, funding, building design and construction, outgassing, early management, and site selection.

A spirit of activism formed each healthy residential development. Awareness of MCS and disability consciousness was relatively high in the area where Ecocase was built, partly due to the activities of a local nonprofit organization formed to provide MCS disability support and promote MCS disability accommodation.

Funding for healthy residential developments was available through either a complex funding arrangement of federal and private funds or through a private commercial mortgage. Some of the nine sources of Ecocase funds were intended to support low-income housing, such as HUD Section 811 funding made possible by seed funding from a CDBG. Greencase was funded by the personal investment and dedication of its founder, who secured a conventional commercial mortgage.

Building-design features examined whether building materials and designs would potentially increase or reduce chemical exposures by considering whether they would outgas pollutants, how they could be maintained, and what grows in them, such as mold. Ventilation was an important component, particularly for Ecocase, which installed louvers and powerful exhaust fans that vented high above the rooftops. Zoning restrictions precluding the design of detached, small cottages for Ecocase led to a compromise for three detached structures, one of which contained enclosed facilities for garbage. A design of detached units was not possible for Greencase due to real estate trends and availabilities. The local government put a stop-work order on Greencase

development when it mistakenly thought that Greencase intended to provide healthcare on site without a hospital permit.

Choosing least toxic building materials was difficult because building materials were not adequately labeled. Some materials were special ordered but substitutions may have been made. Some materials were outgassed on site before they were used in building. Chemically sensitive individuals personally tested materials for suitability because industries did not provide independent testing for the pollutant emissions of their products. Construction oversight was important.

Simple and complex outgassing procedures in the healthy-housing literature were suggested before occupancy. Neither residential development was able to outgas the buildings prior to occupation due to pressures to get the units rented. For Ecocase, an outgassing period was impeded by occupancy requirements tied to their building loan. For Greencase, funds for building maintenance and complete vacancy during an outgassing period were not part of the budget. Designs for ventilation might have facilitated an outgassing period at Ecocase, but, unfortunately, most of the exhaust fans were not operating properly in the first year. Learning to manage the property of a healthy residential development was a challenge for both developments, particularly in learning to make repairs without hurting anyone.

Most factors of site selection related to the ability of the healthy residential developments to secure good outdoor air quality, which is vital to ventilation. Preferable characteristics for a site for each healthy residential development included areas of low-density, high elevation, distance from nearby polluting industries and major roads, proximity to environmentally protected areas, distance from potentially allergenic flora,

and distance from potential sources of exposures to high electromagnetic frequencies, mold, and noise.

The site selection factors that most influenced Ecocase's formation related to zoning ordinances. Multifamily developments were allowable in areas zoned for high density that tended to have poorer air quality. Exclusionary zoning and slow growth restrictions precluded low-income or multifamily developments. Inclusionary zoning made it possible to package their low-income development with highly profitable multifamily housing developments. Zoning and real estate trends precluded small, detached cottages for both communities. Generally, zoning contributed to the separation of land uses that sited polluting industries at a distance from the areas where these communities formed, thus enabling their formation and continuation.

**How and Why Do Healthy Residential Developments Continue? (Chapters 6 and 7)**

The explanation of how and why the two healthy residential developments continued was explained though 13 thematic factors, the last 8 of which related directly to property management: governance, neighborhood relations, community relations, government relations and planning, funding, prospective residents and vacancies, rules governing residents, resident relations, residents' abilities to make individual adjustments to the units, the selection of property managers, property and building maintenance, property management decisions, and major repair and renovation decisions.

Ecocase, Inc. is a nonprofit organization administered by a housing board, whose attitudes and policies toward property management changed from being more to less attentive to residents and their needs. Greencase Rentals and Greencase Condos are privately owned and operated by individuals who live on site and have a high level of

commitment to their businesses, which are subject to their own interest and abilities to maintain their profitability and their environmental health purpose. Owners and board members at both healthy residential developments have felt jaded and "burned out" by the stress of developing and maintaining these healthy residential developments.

People involved with both healthy residential developments have contacted city and county officials and government branches to try to affect policies with mixed success. At Ecocase, a particular property manager, some residents, and some members of the EGP have been involved in working with local government, owing largely to the foment in Ariel County around sustainability. Several local-government departments agreed to provide advanced notice before activities that would potentially cause exposures to residents of Ecocase, such as paving roads and painting curbs. At Greencase, the owner struggled with government rules regarding water-quality issues. For years, the water supply was chlorinated on site to pass state public-health regulations requiring chlorine, then dechlorinated and filtered before being directed into the buildings. Years later, Greencase became the state's first commercial test site for a chlorine-free disinfection system.

Given available data, it appears unlikely that either Greencase Rentals or Ecocase is financially sustainable. Ecocase relies on HUD funding to supplement rent payments, and special grants were necessary to make major repairs and improvements. Greencase owners have used profits from their other business ventures to invest in their healthy residential developments. Annual costs increased dramatically when Ecocase hired a management company. There is also the potential for financial loss stemming from permanent damage due to pollutant contamination. Both healthy residential

developments experienced minor losses related to possible contamination that was remediated.

Both healthy residential developments are in demand, particularly Ecocase, owing in part to its subsidized rent. Its occupancy procedures require a 48-hour trial stay to ensure that tenants can tolerate the available unit. Greencase rents units for a minimum of a week, which some people use as a trial stay before locking in a lower monthly rate. Both healthy residential developments clean vacant units by washing them with baking soda and treating the rooms with very high levels of ozone (above 400mg/hr for several hours), which is completed in a sealed room without people; then the room is aired and the walls are washed with baking soda. At Greencase Rentals, the owner is not able to make some repairs out of concern for the sensitivities of the next tenants.

Both healthy residential developments in this study used lease agreements to specify rules for managers and tenants that are intended to reduce critical toxic exposures. Residents tend to respect the rules because they understand that other residents need to be safe and healthy. However, Greencase experienced an incident in which pesticides were deliberately sprayed in one of the units, resulting in long-term contamination of the affected housing unit and a loss of income during the period necessary to remediate the problem. This incident points to how healthy residential developments are vulnerable to long-term damage from the use of chemicals that are currently legal.

Ecocase, Inc. has a board and a property manager. After several years, the board hired a property-management company, and board meetings were held less frequently, for shorter periods, and to focus on financial matters. The founder, owner, and operator of Greencase Rentals, and the owner and manager of Greencase Condos, are business

people who are concerned about reducing critical toxic exposures in housing and communities. The Greencase owner's management approach changed as the owner set personal boundaries for how far tenants would be accommodated. The first property manager at Ecocase did not work out well, lacking understanding about how to accommodate residents with MCS. In this respect, a later property manager was effective because he listened to residents to comprehend the intricacies of MCS and their needs for property management. A key component of property management at both healthy residential developments is a sense of trust between property managers and residents, all of whom must act to prevent toxic exposures.

Minor repairs and routine-maintenance activities exemplified characteristics of property management at healthy residential developments. These included fragrance-free contractors and vendors, using less toxic products, sealing the vapors of interior spaces where a toxic product was outgassing, overseeing the work of contracted workers, using exhaust fans, opening windows to allow air exchange, providing notice for repairs that might cause exposures, improving water-filtration systems, fixing vents and louvers, choosing tolerable products, and removing appliances for repair outside the unit. Shared washing machines with specified product use at both healthy residential developments had mixed results; some individuals complained that other individuals contaminated the washing machines with their toxic residues, especially from clothes brought by new guests to Greencase.

Under one property manager at Ecocase, written protocols described procedures and methods for many property-management practices, such as providing notice for prospective repairs, interviewing prospective tenants, dealing with conflicts between a

manager and a tenant, and guiding visitors in proper behaviors in preventing critical toxic exposures. This property manager had a method for keeping records of vendors' work and documenting repairs to each unit, including the products that were used. All written protocols and documentation were discarded by the subsequent property manager.

To some extent, property managers at both healthy residential developments train workers to arrive fragrance-free and use least-toxic products and methods, and they have sent workers and contractors away for noncompliance. At least one property manager has given fragrance-free personal-care products to workers. At Ecocase, one property manager was exceptionally thoughtful and thorough in spearheading multiple changes, including the pursuit of exposure sources in the elevator, the installation of a water filter, a formal contract to lease the washing machines that met the needs of Ecocase, and the replacement of smoke detectors that generated residents' anxiety over potentially toxic exposures.

To create safer neighborhoods, both healthy residential developments have asked governments to manage critical toxic exposures that affect their site, but the effectiveness depended in part on maintaining relationships with respective government agencies, which was not done under changing property managers at Ecocase. At Greencase, where the owner/manager lived on site, there was both a professional and personal relationship with tenants.

A major repair at Ecocase was to seal the unpainted and shedding wallboard; this involved special grant funding and extensive collaboration between the property manager and residents to work out fair arrangements for materials selection and the relocation of residents while work was done in their units. In a methodical and collaborative process,

the Ecocase property manager turned the Airing Room into a storage space, involved the residents in a community yard sale, made changes to reduce the potential exposures from the room, and created a fair process to assign individuals' storage spaces. At Greencase, the owner was hesitant to make repairs due to concern for tenants' safety and possibly a lack of funds.

Primary methods used to implement the healthy residential developments were government regulations such as zoning and environmental laws, government financial incentives, especially CDBG funding and housing and rental subsidies from HUD, and voluntary actions of civic associations. The use of these implementation methods was influenced by the voluntary actions of individuals who advocated for pollutant-exposure reductions.

## Implications of Healthy Residential Developments

The formation and continuation of the healthy residential developments were influenced by many factors, as Chapters 5, 6, and 7 revealed. Findings from the case studies have implications for a broad audience, including planners, policymakers, public-health officials, community and housing developers, government agencies, nongovernmental organizations, individuals with MCS, and the general public. This section provides implications, as well as lessons and recommendations, by category.

### Environmental and Public-Health Regulations and Policies

Environmental and public health regulations both helped and challenged the healthy residential developments. One example concerns standards for water quality. Both of the healthy residential developments in this study used advanced water filtration to remove chlorine and other chemicals from their water. While chlorine is an accepted

control method for bacteria in water, it posed problems for people with MCS. Thus, other methods for water disinfection could be explored that would be tolerable to people with MCS and meet water-quality standards.

Another example concerns product labeling. Both residential developments discovered that building products were not required to disclose any or all of their ingredients, on either product labels or Material Safety Data Sheets, which made it difficult to understand possible exposures. Regulations or testing could address the disclosure of ingredients in consumer products, especially those that contain chemicals of possible concern. Less toxic building products may also be cost effective and durable options to current products on the market that may cause pollutant exposures in their installation or during occupancy.

Environmental and public-health procedures to control insect populations by using chemical pesticides can, in turn, be harmful to healthy residential developments. One example is the public use of pesticides, such as aerial spraying. Another is the private use of pesticides, such as termite tenting or landscape application. Property managers in both residential developments selected alternative methods to control pests on site, and then connected with their neighbors, government agencies, and policymakers as a way of effecting changes to pesticide use by others and preventing pesticide exposures on site. The Greencase owner influenced the adoption of a public-use pesticide notification system. Ecocase achieved cooperation from some neighbors and government agencies that agreed to not use pesticides near Ecocase. When the State of California began an emergency campaign to eliminate the light brown apple moth, aerial pesticide spraying at Ecocase was imminent. The State had acquired a federal exemption

from registering the new pesticide and from having to conduct the mandatory environmental-impact assessment. In addition to circumventing federal protections, the State's pesticide operation superseded local government ordinances for IPM that provided greater protections from pesticide exposures. In this case, local protections were overridden by polices and practices at higher levels of government. Thus, existing laws may not protect healthy residential developments from pesticide exposures.

**Land Use Policies**

Exclusionary zoning and slow-growth restrictions made site selection difficult for Ecocase, but inclusionary zoning, intended to increase the supply of affordable housing, enabled the final site selection. The site selectors at Ecocase did not consider the site ideal because it was in a high-density area near roads, highways, and high-tension wires. The creation of zones for multifamily housing that are away from sources of pollutants could address this distance. The healthy residential developments in this study had few empirically based guidelines for selecting sites away from sources of pollution. Research could investigate the appropriate distance of housing from highways, high-tension wires, and other sources of pollutant exposures. Another problem for Ecocase was zoning laws that restricted the development of small, detached cottages with space between them. A revision of such laws could permit the design of healthy residential developments with detached units on a single lot.

The continuation of these healthy residential developments in this study was facilitated and impeded by local ordinances that restricted or allowed behaviors that caused pollutant exposures. This research indicated a need for policies to limit products and practices that contribute to pollution, especially near the healthy residential

developments, such as the use of pesticides and fertilizers, barbecues, cigarettes, scented laundry products, and certain construction and renovation practices, such as painting.

To some extent, cities and counties could conduct reviews of their codes and ordinances in light of how they contribute to increases or reductions in pollutant exposures. The City of San Francisco is an example of a city that conducted such a broad review. With respect to pesticides, the City adopted an IPM ordinance that banned the use of the most toxic pesticides in all public uses, phased out some pesticides, established a pesticide-usage notification system, mandated the cleaning of certain public-use places after pesticides usage (such as playground equipment), and appointed an IPM specialist as a consultant to the city. Related ordinances in San Francisco and elsewhere in the United States have promoted healthy and green building, required the use of low-VOC paints, designated pesticide-free parks or "Cleaner Air" rooms with public signage, and passed toxic trespass ordinances to criminalize involuntary pollutant exposures from private activities.

**Funding Policies**

Funding was a significant factor in the formation and continuation of the case studies. The formation of Ecocase was possible due to a combination of federal, county, and nonprofit funding for affordable and disability housing. Additionally, federal funding made renovations possible at Ecocase and provided continued support for the very low-income renters.

The basic provisions of HUD's Section 811 program served Ecocase well in that Ecocase relied on its provisions for development financing and rental assistance. However, the Section 811 program did not fund portions of the cost of building Ecocase

as attributed to development efforts that used healthy housing techniques, such as costs related to consulting, building design, building materials, and outgassing procedures. Thus, this program could expand its approved costs to better account for the needs of this disability in development practices.

HUD requirements tied to funding that were intended to support people with other disabilities—namely, low slope and bus line proximity—were a significant impediment to site selection, nearly causing Ecocase to lose its funding. An option for future healthy residential developments to waive these requirements could ease the difficulties of site selection.

The Section 811 program left open the option that Ecocase board could change its by-laws to rent to disabled tenants without MCS. This option could be modified to provide more stability for healthy residential communities and their residents.

Finally, the Section 811 program requires projects, such as Ecocase, to have a supportive services plan to meet tenants' needs. It is not clear whether Ecocase tenants required access to a social worker or why Ecocase did not provide it. As the comprehensive needs of people disabled with MCS become better understood, they can be formalized, such as in a HUD handbook.

Considering the high demand for the units at Ecocase, as evidenced by its annually high waiting list, neither private developers nor the nonprofit community can be relied upon to meet the need for affordable housing in healthy residential developments. Meanwhile, Greencase struggled to remain profitable. Thus, additional incentives or public subsidies may be necessary for the formation and continuation of healthy residential developments.

Interestingly, the federal funding programs relevant to Ecocase required consolidated planning for housing. In this case, California has a housing element law that requires that comprehensive plans account for the housing needs of all segments of society, including low-income groups, disabled groups, and other vulnerable populations. The expansion of public-funding opportunities could enable the development and support of healthy residential developments, including their operations, maintenance, and renovations, particularly to ensure accessible housing for low-income and vulnerable groups of people, such as low income individuals disabled by MCS.

Additionally, specific funding considerations affected the continuation of the healthy residential developments, such as extra expenses, the creation of vacancies to make repairs, and the possibility of contamination. Ecocase secured additional federal grants to seal the wallboard soon after occupancy, which was an unanticipated extra expense resulting from construction practices. Both residential developments incurred additional costs from the use of special materials or procedures to prevent pollutant exposures, most notably to facilitate the creation of vacancies to allow time for repairs and renovations to outgas more fully before occupation or reoccupation. Finally, the possibility of pollutant contamination to the healthy residential developments created the need for additional funding to cover the costs of remediation, vacancies, or the downgrading of the unit as unfit for reducing pollutant exposures to the extent required by an individual with chemical sensitivities. New funding opportunities could address some of these specific funding needs of healthy residential developments.

**Landlord–Tenant Laws**

Existing landlord–tenant laws were the basis for the legal relationships of the people in the healthy residential developments. For example, both cases used lease agreements with addenda to specify practices, procedures, and protocols for owners, property managers, and residents. Such lease agreements were tied to bylaws at Ecocase that emphasized the role of the residential development to reduce human exposures to pollutants.

At both cases, no additional restrictive deeds or mortgage terms required owners to maintain the healthy residential development. Owners were free to change their emphasis from reducing exposures to other real estate goals at any time. The continuation of the healthy residential developments is not assured.

A mandatory 48-hour trial stay was required by Ecocase before a lease agreement was signed. This also helped individuals with MCS, who typically need to try out a unit to determine its suitability before signing a rental agreement or lease. Similarly, Greencase offered one-week rentals that allowed individuals to have a trial stay before agreeing to a lease. Landlord–tenant laws are typically flexible enough to include a trial stay in a rental agreement or lease, but they are not a guaranteed right for vulnerable individuals who may need this option. Thus, the "trial stay" could be an important component in housing agreements.

Both residential developments found that the deposit did not always cover the costs of damage to a rental unit. It is possible for a unit in a healthy residential development to become so damaged by contamination that it will be unfit to rent to individuals who are disabled by MCS. In such cases, the market may not be able to assign

an affordable price for the rental deposit to cover contamination by some pollutants. Moreover, healthy housing and healthy residential developments can be rendered unusable by any action that causes irreparable contamination, such as from the use of certain pesticides, which could be intolerable to individuals with MCS for a very long time. Because of this potential for contamination, healthy residential developments may not be feasible without an alternative funding structure for cleaning and making repairs between tenants or owners, or an alternate plan for use of the property.

**Site Selection**

Selecting a site for a healthy residential development is possibly the most important decision in the formation and continuation of a healthy residential development. In the case studies, preferred sites had characteristics that facilitated the active and passive ventilation of clean ambient air. Some considerations by the site selectors of the Ecocase included low-density areas, areas away from roads and industry, and sites near undeveloped areas or waterways. According to Ecocase site selectors, the location should allow a design for the site that creates sufficient buffers between designated areas of the healthy residential development and adjacent sources of pollution, such as roads, parking lots, garbage storage areas, and high-tension wires. These many constraints complicated site selection. One conclusion is that most sites are not favorable for healthy residential developments due to current conditions of density, zoning, and development.

**Design and Construction**

The individuals involved in the design, construction, and renovation of these case studies did not have adequate guidelines for healthy building or green building. Since

then, many resources have become available to guide effective design strategies and building practices. These resources include detailed case studies, even several about the Ecocase specifically. Yet some builders using these resources have found them inadequate for reducing pollutant exposures to the extent required by individuals with MCS. Just like in the building and renovation of the case studies, unique problems arise before, during, and after construction. Therefore, effective design strategies and building products often involve experimental approaches.

Both healthy residential developments use on-site, whole-building water filtration systems. For years, the Greencase had to add and then remove chlorine to meet both drinking water standards and tenants' need to eliminate chlorine exposures. Later, the state allowed it to become a test site for chlorine-free water disinfection. Chlorine and other pollutants in the water supply may be a concern at other healthy residential developments. Designs for healthy residential developments can address questions about local water quality and their goals for water quality on site.

The quiet, powerful exhaust fans at the Ecocase were considered effective for ventilation. Likewise, the design of healthy residential developments can employ control systems for reducing pollutant exposures from indoor air, such as active and passive ventilation systems using building products and designs such as exhaust fans, louvers, windows that open easily by building occupants, air filtration systems, and heating and cooling systems. The research and development of control systems and building technologies could provide new options for ventilation, filtration, and separation of indoor air in healthy residential developments.

As both residential developments discovered during construction, oversight is essential in the formative stage to prevent unwanted product substitutions and to ensure that on-site behaviors are consistent with guidelines for preventing pollutant exposures, such as not smoking on-site or not spraying insect repellent.

According to a former Ecocase property manager and the owner of the Greencase Rentals, the planning and design of healthy residential developments should include outgassing procedures and funding to complete them. The developers and builders at these case studies lacked information on effective methods for outgassing buildings prior to occupation, and for outgassing appliances and furnishings prior to their installation and use in buildings. Additional research could evaluate various methods.

By keeping a record of building products used in construction, property managers can use this information to improve their decision-making around maintenance and repairs. For example, from the experience of one property manager, expensive and non-standard imported fans and toilets were cheaper to replace with conventional and domestic products that seemed to be just as safe or safer, and he could not find any information as to why the original products had been selected in the first place. He indicated that a record documenting product selections would have been helpful to him, and he was diligent in creating a record of his own repairs to each unit.

**Property Management**

Property management ensures the continuation of a healthy residential development because the day-to-day operations of the residential development involve the management of pollutant exposures. Thus, healthy residential developments can carefully select their property managers. The interviewees in this study suggested that

the required skills of a property manager include their interest in or expertise in reducing pollutant exposures, interpersonal skills for working with residents, and a willingness to use experimental and participatory approaches for understanding problems and troubleshooting solutions.

Interviewees suggested that the job of the property manager in reducing exposures included many specific tasks. Among them, two stand out as indispensible: providing advanced notice for prospective repairs, enough advanced notice to allow a resident to respond to the notice, such as by making arrangements to be absent the day of the repairs; and, conducting and requiring practices that reduce pollutant exposures, especially related to pest management, fragranced-product use, and all cleaning practices.

The importance of these practices in property management was highlighted by the mixed results of a decision to hire a property-management company at the Ecocase. The company required that the property manager manage the healthy residential development as a regular property without consideration for the unique qualities of property management that had been employed prior to that decision. Owners and landlords who hire private companies to take over property management risk losing control over essential practices in a healthy residential development.

At Ecocase, at least one property manager and some members of the board considered hiring a social worker. Although Ecocase found it an unaffordable option, for reasons unknown, other healthy residential developments may be able to plan for necessary social services. Property managers need to work with residents to find ways to provide for tenant needs in healthy residential developments. Design standards for disabled people can more comprehensively address the needs of people with MCS,

particularly in housing, such as handbooks for supportive housing for people with disabilities.

## Future Research

This dissertation research provides the foundation and the motivation for continued work in this area. Topics for further investigation include the following:

1. Developing methods to create, implement, and sustain both healthy housing units and healthy residential developments.

Research could examine the interplay between planning and regulation, and the roles and partnerships among various organizations, including nonprofit associations, planners, grassroots activists, government agencies such as housing authorities, industries, and real estate professionals, including developers. The effectiveness of implementation methods may depend on adequate funding sources, aspects of site selection, and property-management practices, especially issues of governance such as enforcement; future research can explore these problems and opportunities.

As this research showed, intergovernmental sovereignty and network management problems can occur, as in the case in which a state agency intended to spray pesticides in a healthy residential development, whereas a local pesticide ordinance banned this action. Future research could investigate solutions to problems in which higher level governments intersect with lower level governments, and their actions to address pollutant exposures, such as through low-VOC paint ordinances, environmentally preferable purchasing programs, and toxic trespass ordinances.

To broaden our understanding of effective implementation, future research could examine complementary and reinforcing methods of implementation. One way is to

adapt and synthesize aspects of these case studies with lessons from existing interventions, such as the healthy-schools movement, healthy-homes initiatives, healthy-hospitals programs, and asthma-prevention programs. Some techniques to create healthy residential developments will be specific to certain places or activities, and research can explore opportunities to integrate multiple health objectives into policies and programs.

2. Understanding and reducing sources of exposures that initiate and trigger MCS, which can help to promote both primary and secondary prevention, and to plan and implement healthy residential developments.

The identification and prioritization of pollutants to be reduced in healthy residential developments can be expanded from chemical pollutants to other agents, such as electromagnetic frequencies, noise, and nanoparticles. Investigating the experiences and practices for the prevention and treatment of allied illnesses, such as asthma, which is also triggered by pollutant exposures, would contribute to criteria and methods to develop healthy residential developments.

For individuals disabled with MCS, research can investigate the need for segregated rather than integrated housing, the levels of independence possible by various subgroups, the feasibilities of various building designs such as independent cottage-style housing and attached housing, and the practices of property management for housing units and common spaces that may become unique in their ability to reduce exposures due to contamination from use.

3. Investigating exposures to better understand links with sources, and to improve mitigation strategies.

This study demonstrated a methodological approach for evaluating pollution based on reports of personal exposures. Typically, pollution is judged by measuring emissions from a source or by sensing pollutants to an exposure monitor. This study measured pollution based on the experiences of people who are sensitive to critical toxic exposures. Future research can explore the integration of self-reporting methodologies with existing participatory approaches in planning and public health to better understand pollutant exposures, their health effects, and efforts to reduce them.

Self-reporting methodologies offer a complementary approach to other methods that have been developed or are being advanced. Currently, tools to monitor exposures at the community level are not widely available, are expensive, or are awkward to use. Future exposure-measurement methods will enable residential developments to screen for exposures to pollutants and thus routinely monitor the results of programs intended to reduce pollutant exposures. Local data that link pollutant exposures at the residential development level to incidence of diseases might generate support for implementing healthy residential developments.

4. Investigating experiences and practices in other countries, especially those with relatively high recognition of MCS, such as Germany, Australia, Japan, and Canada.

MCS has been recognized by dozens of international and country-specific organizations, agencies, commissions, institutes, departments, boards, and court decisions. An understanding of the comparative policy environments for the recognition, treatment, and accommodation or people with MCS would contribute to a better understanding of healthy residential developments.

## Conclusions

Reducing human exposures to pollutants is the core mission of healthy residential developments. The concept of "healthy residential developments" is but one aspect of healthy communities, sustainable communities, ecological communities, and healthy cities. The principles and practices of the two healthy residential developments that were examined can guide building occupants, owners, developers, property managers, builders, planners, and policymakers to form and manage residential developments that will essentially reduce everyone's exposures to pollutants.

# APPENDIX

**Sample Interview Protocol**

**Resident Interview at The Ecocase** Name: _____
(to be adapted for former resident) Date: _____
**[Introduction and Informed Consent procedures]**

DESCRIPTION OF THE ECOCASE
When did you move here?
Where were you living before?
Why did you move here?
Are you planning to stay and why?
What was your first impression of the Ecocase? Was it like you expected? How has the Ecocase changed since you've been here?

EVALUATION OF IMPLEMENTATION METHODS
What makes the Ecocase safe for you and what makes you sick?
How do you like your apartment?
Have you always lived in the same apartment?
What sorts of changes have you made to your apartment to make it safe for you?
How did you decide to make those changes?
What do you like best about living at the Ecocase?
What do you dislike the most about living here?
Do you ever get sick from toxic exposure X1? X2? X3? … X14? (X1-14 are the categories of exposures in the survey) And why or why not? Has anyone else you know gotten sick because of toxic exposure X1 et al.?

FORMATION
What do you think of this neighborhood? What sorts of problems arise because of the neighborhood?
Do neighbors use pesticides? Do the traffic fumes bother you? If you could change anything about the neighborhood to make it safer for you, what would you do?
What do you like about the design of this building? Are there any particular things about the way it has been built that make it safe for you to live in?
Are you satisfied with cross-ventilation and breezes?
Do any problems arise because the housing units are attached rather than detached?

CONTINUATION: PROPERTY MANAGEMENT
How does Resident's Council work? Do you like Resident's Council?
How are issues discussed and decisions made?
What sorts of issues come up? Give me an example of something you discussed.
Who facilitates the meetings?
How close are residents to each other?
Is everybody friends? How are resident relations? Is there group cohesion? Has anyone ever acted out of spite?

Have you met the people on the Board of Directors? What do you think of their work? What residents have served on the board?
Do you know the property managers? What do you think of their work? Do they understand MCS? Have there been any problems with property managers?

Have there been any problems with maintenance personnel working in the building? Why or why not?

GENERAL
Is there anything else that you would like to tell me about how the Ecocase?
What do you think this place means for other people with MCS? Have you been an activist for MCS disability issues?

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# VITA

## Caitlin Janson Waddick

Caitlin Janson Waddick's research seeks to re-integrate planning and public health by understanding how principles of environmental health, such as reducing pollutant exposures, can be integrated with planning. Planning has historically regulated pollution through measurements of pollutant emissions. Caitlin's research demonstrates an approach for environmental planning, regulation, and assessment by evaluating pollution according to how pollutants actually reach people, such as by using first-hand reports of human exposure. Her other research interests include food systems, climate change, and sustainability.

Caitlin has given presentations on human exposure assessment, healthy housing, healthy communities, food planning, and academic writing at various national and international conferences, as well as to planning students, alumni groups, and groups of parents wanting to understand and reduce their families' everyday pollutant exposures. She is designing a guide about how to implement environmentally healthy communities that can prevent pollutant exposures and accommodate individuals who are susceptible to pollutant exposures.

As recipient of an EPA STAR Fellowship, Caitlin performed an epidemiological study of environmental factors that contribute to illness, which was published in the *Archives of Environmental Health*. She has also received scholarships and grants from Architects, Designers, and Planners for Social Responsibility; the National Association of Garden Clubs, the Garden Club of Georgia; and the American Planning Association. She has served on the boards of the Association of Collegiate Schools of Planning, the Atlanta Wellesley Club, the Student Planning Association at Georgia Tech, and the Vermont Wellesley Club. She has also worked and volunteered in environmental education.

Caitlin was born in New York City and has lived in Georgia, Missouri, Massachusetts, Kenya, Costa Rica, Colorado, California, and Vermont, where she has enjoyed the outdoors. Caitlin's undergraduate studies in environmental anthropology at Wellesley College included field research in Mexico, Costa Rica, and Kenya, and her travels will soon take her to Pakistan, China, and Peru.