U.S. Department of Justice
Office of Community Oriented Policing Services

Problem-Oriented Guides for Police
Response Guides Series
No. 8

COPS
COMMUNITY ORIENTED POLICING SERVICES
U.S. DEPARTMENT OF JUSTICE

Improving Street Lighting to Reduce Crime in Residential Areas

by
Ronald V. Clarke

www.cops.usdoj.gov

Center for
Problem-Oriented Policing

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Ronald V. Clarke

This project was supported by Cooperative Agreement Number 2006-CK-WX-K003 by the Office of Community Oriented Policing Services, U.S. Department of Justice. The opinions contained herein are those of the author and do not necessarily represent the official position of the U.S. Department of Justice. References to specific agencies, companies, products, or services should not be considered an endorsement by the author or the U.S. Department of Justice. Rather, the references are illustrations to supplement discussion of the issues.

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ISBN: 1-932582-91-6

December 2008

About the Response Guide Series

The *Response Guides* are one of three in the series of *Problem-Oriented Guides for Police*. The other two are the *Problem-Specific Guides* and *Problem-Solving Tools*.

Problem-Oriented Guides for Police summarize knowledge about how police can reduce the harm caused by specific crime and disorder problems by preventing problems and improving overall incident response. They are not guides to investigating offenses or handling specific incidents. Neither do they cover the technical details about how to implement specific responses. The guides are written for police—of whatever rank or assignment—who must address the specific problems the guides cover. The guides will be most useful to officers who are capable of the following:

- They understand basic problem-oriented policing principles and methods.
- They can look at problems in-depth.
- They are willing to consider new ways of doing police business.
- They understand the value and the limits of research knowledge.
- They are willing to work with other community agencies to find effective solutions to problems.

Publications in the Response Guide Series summarize knowledge about whether police should use certain responses to address various crime and disorder problems, and about what effects they might expect. Each guide offers the following:

- Describes the response
- Discusses the various ways police might apply the response
- Explains how the response is designed to reduce crime and disorder

- Examines the research knowledge about the response
- Addresses potential criticisms and negative consequences that might flow from use of the response
- Describes how police have applied the response to specific crime and disorder problems, and with what effect.

The *Response Guides* are used differently than the Problem-Specific Guides. Ideally, police should begin all strategic decision-making by first analyzing the specific crime and disorder problems they are confronting, then using the analysis results to devise particular responses. Certain responses are so commonly considered and have such potential to help address a range of specific crime and disorder problems that it makes sense for police to learn more about what results they might expect from them.

Readers are cautioned that the *Response Guides* are designed to *supplement* problem analysis, not to *replace* it. Police should analyze all crime and disorder problems in their local context before implementing responses. Even if research knowledge suggests that a particular response has proved effective elsewhere, that does not mean the response will be effective *everywhere*. Local factors matter in choosing which responses to use.

Research and practice have further demonstrated that, in most cases, the most effective overall approach to a problem is one that incorporates several different responses. A single response guide is unlikely to provide sufficient information on which to base a coherent plan for addressing crime and disorder problems. Some combinations of responses work better than others. How effective a particular response is depends partly on what other responses police use to address the problem.

The *Response Guides* emphasize effectiveness and fairness as the main considerations police should take into account when choosing responses, but recognize that they are not the only considerations. Police use particular responses for reasons other than, or in addition to, whether they will work or will not work, and whether they are deemed fair or not fair. Community attitudes and values, and the personalities of key decision-makers, sometimes mandate different approaches to addressing crime and disorder problems. Some communities and individuals prefer enforcement-oriented responses, whereas others prefer collaborative, community-oriented, or harm-reduction approaches. These guides will not necessarily alter those preferences, but are intended to better inform them.

The COPS Office defines community policing as "a philosophy that promotes organizational strategies, which support the systematic use of partnerships and problem-solving techniques, to proactively address the immediate conditions that give rise to public safety issues such as crime, social disorder, and fear of crime." These guides emphasize problem-solving and police-community partnerships in the context of addressing specific public safety problems. For the most part, the organizational strategies that can facilitate problem-solving and police-community partnerships vary considerably and discussion of them is beyond the scope of these guides.

The guides in the *Response Guides Series* have drawn on research findings and police practices in the United States, the United Kingdom, Canada, Australia, New Zealand, the Netherlands, and Scandinavia. Even though laws, customs and police practices vary from country to country, it is apparent that the police everywhere experience common problems. In a world that is becoming increasingly interconnected, it is important that police be aware of research and successful practices beyond the borders of their own countries.

Each guide is informed by a thorough review of the research literature and reported police practice, and each guide is peer-reviewed anonymously by a line police officer, a police executive, and a researcher before publication. The review process is managed independently by the COPS Office, which solicits the reviews.

The COPS Office and the authors encourage you to provide feedback on this guide and to report on your own agency's experiences dealing with a similar problem. Your agency may have addressed a problem effectively using responses not considered in these guides and your experiences and knowledge could benefit others. This information will be used to update the guides. If you wish to provide feedback and share your experiences, e-mail the information to askCOPSRC@usdoj.gov.

For more information about problem-oriented policing, visit the Center for Problem-Oriented Policing online at www.popcenter.org. The web site offers free online access to the following:

- The *Response Guides Series*
- The companion *Problem-Specific Guides* and *Problem-Solving Tools Series*
- Special publications on crime analysis and on policing terrorism
- Instructional information about problem-oriented policing and related topics
- An interactive problem-oriented policing training exercise
- An interactive *Problem Analysis Module*
- Online access to important police research and practices
- Information about problem-oriented policing conferences and award programs.

Acknowledgments

The *Response Guides* for Police are produced by the Center for Problem-Oriented Policing, whose officers are Michael S. Scott (Director), Ronald V. Clarke (Associate Director), and Graeme R. Newman (Associate Director). While each guide has a primary author, other project team members, COPS Office staff, and anonymous peer reviewers contributed to each guide by proposing text, recommending research, and offering suggestions on matters of format and style.

The project team that developed the guide series comprised Herman Goldstein (University of Wisconsin Law School), Ronald V. Clarke (Rutgers University), John E. Eck (University of Cincinnati), Michael S. Scott (University of Wisconsin Law School), Rana Sampson (Police Consultant), and Deborah Lamm Weisel (North Carolina State University.)

Members of the San Diego; National City, California; and Savannah, Georgia police departments provided feedback on the guides' format and style in the early stages of the project.

Debra Cohen, Ph.D. and Cynthia Pappas oversaw the project for the COPS Office and research for the guides was conducted at the Criminal Justice Library at Rutgers University by Phyllis Schultze. Stephen Lynch edited this guide.

The author also wishes to thank Patrick Baldrey for help with technical lighting terms.

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Introduction

Improved street lighting is widely thought to be an effective means of preventing crime, second in importance only to increased police presence. Indeed, residents in crime-ridden neighborhoods often demand that the lighting be improved, and recent research generally bears out their expectation that improved lighting does reduce crime.

§Problem-Oriented Guides for Police, Response Guides Series No. 2, *Closing Streets and Alleys to Reduce Crime*

§§Problem-Oriented Guides for Police, Response Guides Series No. 4, *Video Surveillance of Public Places*

This guide is written to help community policing officers decide whether improved lighting is an appropriate response to a crime or disorder problem that might be confronting a particular neighborhood or community. It assumes that a detailed problem analysis has been conducted and that police, community and business leaders, and other stakeholders are exploring ameliorative responses, particularly improved street lighting. It explains why better street lighting can help reduce fear, crime, and disorder, and summarizes the literature on the effectiveness of better lighting. It discusses the considerations that should be weighed in pursuing this approach, suggests questions that should be asked, and lists the steps that should be followed in improving lighting. Finally, it suggests measures that can be used to assess the effectiveness of the lighting solutions that have been implemented.

Improved street lighting is much less controversial than some other responses to street crime discussed in this series of problem-oriented policing guides, including street closures§ and video surveillance.§§ Even so, it does have some potential costs (apart from monetary costs) and, as will be discussed elsewhere in the guide, its relationship to crime is not as straightforward as is usually assumed.

Scope of the guide

§Problem-Oriented Guides for Police, Tools Guides Series No. 8 *Using Crime Prevention Through Environmental Design in Problem Solving.*

This guide deals with lighting improvements intended to reduce crime in public streets and alleys in residential neighborhoods. It does not discuss the following:

1. The lighting of new residential neighborhoods, subdivisions, or gated communities.
2. Improved lighting of parking lots, shopping malls, campuses, hospitals, or other public and private facilities.
3. Security lighting for private residences.
4. Lighting and road safety.

As explained below, problem-oriented policing projects to reduce crime in residential neighborhoods have usually made other environmental changes in conjunction with improvements in street lighting. In some of these projects extensive use has been made of the principles of Crime Prevention through Environmental Design (CPTED). These principles have been explained in another guide in this series§ and will not be repeated here. This guide focuses solely on street lighting improvements, whether or not made in the context of broader environmental changes.

Although led by police, all successful problem-oriented policing projects in crime-ridden neighborhoods depend upon a partnership among police, local residents, community leaders, elected officials, and municipal officers. Police leading the project must invest a considerable amount of time in making these partnerships work. This guide does not attempt to discuss the nuances of managing these partnerships, but it does discuss ways of dealing with concerns that might be expressed about proposed street lighting improvements.

Because of the lack of relevant research, this guide says little about the effects of improved lighting on fear. Although there is little doubt that improved lighting reduces fear, in most cases this is merely an added benefit from the reduction in crime. Reducing unwarranted fear is a legitimate objective of lighting improvements in settings such as college campuses or municipal parking lots. However, it would be difficult to persuade public officials to spend taxpayer money to improve lighting without the expectation that both the fear and incidence of crime would be reduced. In fact, according to research quoted in the New York State Energy Research and Development Authority *How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Elected/Appointed Officials,*[1] simply increasing light levels beyond a certain point will neither make an area seem safer nor increase perceptions of safety. That is, glare and high light levels that make it harder for people to see can increase fear, whereas uniform lighting that eliminates both glare and dark shadows can lead to increased feelings of security.

Again, because of the lack of relevant research, this guide says little about the cost benefits of improved lighting. It is relatively easy to estimate the costs of relighting projects, but calculating the benefits is much more difficult. This involves estimating the numbers of different types of crime prevented by the improved lighting and putting a cost to these crimes—not just cost to the victim but also to the police, the municipality, and the criminal justice system. It also involves calculating the benefits of reduced fear, increased freedom of movement, and related factors. Unsurprisingly, no existing research has undertaken these calculations.

Finally, this guide provides only a brief introduction to the practicalities of selecting and installing improved lighting. Street lighting improvements entail many considerations, both in the level and quality of lighting desired and how these are to be achieved. You can expect the local utility company or municipal officials to make many of these decisions, but if you have a basic logistical understanding of the issues you will be able to provide useful input regarding the needs of your particular neighborhood. And although experts will commission and supervise the work, you can help by acting as a liaison between the municipality, the local community, and contractors. You might also find it necessary to "progress-chase" the work to ensure that installation does not lag.

How Might Improved Lighting Affect Crime?

In most people's minds, there is a simple and direct relationship between lighting and crime: better lighting will deter offenders who benefit from the cover of darkness. Improved lighting means that offenders are more likely to be seen by someone who might intervene, call the police, or recognize the offender. Even if this does not happen, some offenders who fear that it might would be deterred from crime.

Things are rarely as simple as they first appear. Professor Ken Pease,[2] a crime-prevention expert, has explained how improved lighting can have a variety of different effects on crime. In particular, not only can it sometimes increase crime, but it can also affect not just nighttime crime, but daylight crime as well. Familiarize yourself with all the possible effects he discusses, which are summarized in Box 1 and Box 2.

Box 1: How Improved Lighting Could REDUCE Crime (adapted from Pease 1999).

In Darkness

1. Improved lighting deters potential offenders by increasing the risk that they will be seen or recognized when committing crimes.
2. Police become more visible, thus leading to a decision to desist from crime.
3. If improved lighting leads to the arrest and imprisonment of repeat offenders they can no longer commit crimes in the area.
4. New lighting can encourage residents to spend more time on their stoops or in their front yards in the evenings and thus increase informal surveillance.
5. Improved lighting can encourage more people to walk at night, which would increase informal surveillance.

In Daylight

1. New lighting shows that city government and the police are determined to control crime. As a result, potential offenders might no longer see the neighborhood as affording easy pickings. In addition, citizens might be motivated to pass on information about offenders.
2. Better lighting can increase community pride and cohesiveness, leading to a greater willingness to intervene in crime and to report it.
3. If offenders commit crime in both light and darkness, nighttime arrests and subsequent imprisonment would reduce both daytime and nighttime crime.

Box 2: How Improved Lighting Could INCREASE Crime (adapted from Pease 1999).

In Darkness

1. Increased social activity outside the home in the evenings can increase the number of unoccupied homes available for burglary.
2. Increased visibility of potential victims allows better assessment of their vulnerability and the value of what they carry. Offenders might more easily be able to see if parked cars contain valuable items.
3. Increased visibility allows better judgment of the proximity of "capable guardians" who might intervene in crime.
4. Better lighting might facilitate activities like drug dealing and prostitution.
5. Better lit streets might attract disorderly youths from nearby areas.
6. Improved lighting of rarely used footpaths might facilitate undesirable behavior.

In Daylight

1. Disorderly activities focused upon a newly illuminated area can spill over into the use of that place as a daylight meeting point.

§Described by Welsh and Farrington (2007) in a systematic review of the crime-prevention effects of improved lighting undertaken for the Swedish National Council for Crime Prevention.

Two theories underlie Professor Pease's ideas about the crime-prevention effects of improved street lighting.§

1. Street lighting is a situational crime-prevention measure that focuses on reducing opportunity and increasing risk through modification of the physical environment.
2. Street lighting strengthens informal social control and community cohesion through the promotion of social interaction and investment in neighborhood infrastructure.

Some of the effects identified by Pease are more plausible than others, but his lists can help you in two main ways: (1) they alert you to the fact that improved lighting might not always lead just to reductions in nighttime crime, but can sometimes have other results as well and (2) they alert you to possible arguments that might be used by the supporters and opponents of improved lighting.

Will Improved Lighting Displace Crime to Nearby Areas?

Pease's hypotheses concern the different ways in which improved street lighting might affect the neighborhood where it is installed. But what about nearby neighborhoods? Might not criminals simply commit their crimes where the lighting is still poor? This phenomenon, known as spatial or geographical displacement, might seem an obvious result of improved lighting, but again, matters are not so simple, as is shown by the following.

1. Research studies show that displacement occurs much less often than most people, police included, assume. For example, a review of 55 studies of displacement undertaken for the Dutch Ministry of Justice found that displacement occurred in only 22 instances. When it did occur, it was never complete, so that there was always a net benefit of the crime-prevention measure.[3]
2. A recent U.S. study concluded that street offenders are much more likely to adapt their methods to the new conditions or to displace their activities to a different time of the day, rather than to offend elsewhere.[4]

3. Rather than displacement, many recent studies have found that there is diffusion of benefits to nearby areas. This means that the crime-prevention measures have a beneficial influence beyond the places that they target, perhaps because offenders are not exactly sure where the crime-prevention measures have been introduced. Obviously, this is much more likely if offenders are not local residents.

For police officers, the main implication of this research is that although improved street lighting might displace crime into nearby neighborhoods, it is just as likely to reduce crime in these neighborhoods because of a diffusion of benefits.

What Do Scientific Evaluations Show?

The discussion above shows just how complicated it can be to evaluate the effects of improved street lighting. The evaluation must consider the effects of improved lighting on crimes in daylight hours as well as in darkness. It must look for both increases and reductions in crime; and not just for the relit area, but also for a comparable control area where the lighting has not been improved. It must examine the effect of better lighting on different kinds of crime, because its effect is not consistent for all types of crime. And it must examine not just the displacement of crime to nearby areas but also the possible diffusion of benefits. Finally, the evaluation should consider other possible benefits of improved lighting, such as reduced fear.

If this were not enough, the most recent review of lighting studies[5] has also noted the following:

> The effects of improved street lighting are likely to vary in different conditions. In particular, they are likely to be greater if the existing lighting is poor and if the improvement in lighting is considerable. They may vary according to characteristics of the area or the residents, the design of the area, the design of the lighting, and the places that are illuminated. For example, improved lighting may increase community confidence only in relatively stable homogeneous communities, not in areas with a heterogeneous population mix and high residential mobility. The effects of improved lighting may also interact with other environmental improvements, such as closed circuit television (CCTV) cameras or security patrols.

§Table adapted from Welsh and Farrington (2007).

This means that studies should clearly describe the nature and intensity of the improvements in lighting, the general neighborhood conditions, and any other contemporaneous crime-prevention measures. Indeed, a consistent finding of problem-oriented policing projects is that a smart mix of responses, tailored to the situation, produces the best results.

Few if any published studies meet all these evaluation requirements; indeed, it would be very difficult to do so. The principal question examined in most published evaluations is whether street lighting reduces crime at night. This was the focus of eight studies undertaken in the United States, seven of them during the 1970s (see Table 1).

Table 1: Eight Street Lighting Evaluations in the United States.§

Study	City	Intervention Area	Increase in Lighting	Other Intervention	Outcome Measure	Follow-up (months)	Effect
Atlanta Regional Com. (1974)	Atlanta, Georgia	City center	4 times	None	Crime (robbery, assault, and burglary)	12	Desirable effect; no displacement
DIFL* (1974)	Milwaukee, Wisconsin	Residential and commercial area	7 times	None	Crime (property and person categories)	12	Desirable effect; some displacement
Inskeep and Goff (1974)	Portland, Oregon	Residential neighborhood (high crime)	2 times	None	Crime (robbery, assault, and burglary)	6 or 11	Null effect; no displacement or diffusion
Wright et al. (1974)	Kansas City, Missouri	Residential and commercial areas	No information	None	Crime (violent and property offenses)	12	Desirable effect (for violence); some displacement
Harrisburg P.D. (1976)	Harrisburg, Pennsylvania	Residential neighborhood	No information	None	Crime (violent and property offenses)	12	Null effect; no displacement
Sternhell (1977)	New Orleans, Louisiana	Residential and commercial areas	No information	None	Crime (burglary, vehicle theft, and assault)	29	Null effect; no displacement
Lewis and Sullivan (1979)	Fort Worth, Texas	Residential neighborhood	3 times	None	Crime (total)	12	Desirable effect; possible displacement
Ouinet and Nunn (1998)	Indianapolis, Indiana	Residential neighborhood	No information	Police initiatives	Calls for service (violent and property crime)	7 to 10	Null effect; no displacement

* Department. of Intergovernmental Fiscal Liaison

Although four of these studies found desirable effects from improved lighting, the others did not; a review published by the U.S. Department of Justice of the seven studies undertaken in the 1970s concluded that improved lighting was not an effective means of preventing crime.§ However, three more recent studies published in the United Kingdom (see Table 2) found significant reductions in crime both in daylight and at nighttime, with no apparent displacement and in one case, some diffusion of benefits.

§The report is titled *Street Lighting Projects: National Evaluation Program. Phase 1 Report* (Tien et al. 1979).

§§Washington, D.C.: U.S. Department of Justice, National Institute of Justice. Table adapted from Welsh and Farrington (2007).

§§§Welsh and Farrington (2007, page 8). This percentage improvement might overstate the effect of improved street lighting because their meta-analysis included two studies undertaken in the United Kingdom (not reported in Table 2) that examined the effect of improved lighting in a parking lot and a center city market.

Table 2: Street Lighting Evaluations in the United Kingdom.§§

Study	City	Place	Increase in lighting	Other Intervention	Outcome Measure	Follow-up (months)	Effect
Shaftoe (1994)	Bristol	Residential neighborhood	2 times	None	Crime (total)	12	Desirable effect; diffusion and displacement not measured
Painter and Farrington (1997)	Dudley	Local authority housing estate	2 times	None	Crime (total and types of offenses)	12	Desirable effect; no displacement
Painter and Farrington (1999)	Stoke-on-Trent	Local authority housing estate	5 times	None	Crime (total and types of offenses)	12	Desirable effect; diffusion, no displacement

A recent authoritative review, which used a well-established methodology to combine the results of all the studies from the United States and the United Kingdom, concluded that improved street lighting led to a "21 percent decrease in crime compared with comparable control areas."§§§ Reductions in crime of this amount are worthwhile but, of course, there is no guarantee that better lighting will reduce crime in your neighborhood.

The review could not determine whether these improvements were the result of situational deterrence or improved community pride and cohesion. The review concluded that improved street lighting had a larger effect on property crimes than on violent crimes, but offered no explanation for this result. More detailed research showing the effect on specific types of property crime and violent offenses is needed.

What Use Have Police Made of Improved Street Lighting?

The best source of information on the use of improved street lighting by law enforcement is the collection of project reports submitted for the Goldstein and the Tilley Awards.§ Although few of these projects focused specifically on improved street lighting, many projects that have attacked disorder in deprived or rundown neighborhoods have included improved street lighting in a broad package of crime-prevention measures. The packages often included both environmental improvements such as neighborhood cleanups (vandalism repair, graffiti removal, tree trimming), and efforts to improve community cohesion and function. The lighting improvements generally involved the upgrade or repair of existing lighting in particular street segments or crime hot spots.

§See www.popcenter.org for these submissions.

Projects Focused on Crime and Disorder in Deprived, Rundown Neighborhoods

Two good examples of these types of projects are the Hopwood Triangle, a finalist for the Goldstein Award in 2004,[6] and the New Helvetia and River Oaks Project, a 1996 Goldstein Award winner.[7]

The Hopwood Triangle is a development of 91 dwellings owned by the City of Preston, in Lancashire, United Kingdom. Located close to the city center and two main arterial routes, the development had seen no recent investment and had slipped into a spiral of decline, with an increase in damaged properties, burglary, prostitution, and antisocial behavior. It was proving impossible to rent the vacated dwellings. Remaining tenants were increasingly apathetic about criminal and antisocial behavior.

The Goldstein Award submission describes a multiagency project led by the police that was designed to deliver sustainable changes and improvements. In partnership with Preston City Council Central Housing Department, the Parks Department, the Millbank Court, and the local community, a range of responses were developed over a 2-year period, including the following.

- A Crime Prevention through Environmental Design survey that led to a plan for physical improvements throughout the development that included improved lighting
- Identification and eviction of problem tenants
- Targeted enforcement of offenders
- Formation of a Residents' Association and a Neighborhood Forum
- Establishment of a "local lettings policy"
- Formation of Neighborhood Watch
- Operation Curb/Safer Sex Works, targeting prostitution.

The project produced an overall decline in crime of 52 percent; in property damage and vandalism of 73 percent; in burglary of 28 percent; and in vehicle theft and vandalism of 80 percent. Calls to police declined by 38 percent, with a resultant cost saving to police of £82 ($150) per dwelling. In addition, many physical improvements were made to the development.

The New Helvetia and River Oaks Project, undertaken in Sacramento, California, sought to rehabilitate a downtown neighborhood consisting of two adjacent public housing projects decimated by gang and narcotics problems. The population was estimated to be 40 percent juveniles, with most heads of households being single women. In 1991, there were more than 1,900 calls for service—about 2.5 calls per

household—and more than 470 reported crimes, of which 57 were assaults. Sting operations, together with intensive police presence every night, produced more than 140 drug arrests in a 6-month period, but failed to have any significant effect on the problem. In 1992, calls for service increased again, peaking at more than 2,350 for the project area. Despite these numbers, it was clear that many crimes related to drugs were never reported.

Two Neighborhood Police Officers were assigned to the project and given an office in the housing complex. They undertook an extraordinarily intensive and prolonged effort to bring about a reduction in the crime problem. They emphasized community involvement, heavy enforcement, reaching at-risk children, and forming the many partnerships necessary to gain access to both short-term and long-term resources. Two of the more significant accomplishments were the formation of the V Team, a program designed to strengthen the minds and bodies of community youth, and the elimination of the open-air narcotics market. During the first 40 days of the project, 70 arrests were made for major narcotics violations; by 1994 police had made more than 500 arrests. Officers seized several cars, thousands of dollars, electronic equipment, and jewelry as proceeds of drug transactions.

The improved lighting component included removing heavy growth from existing lighting and poles, repairing all broken lights, and installing additional sodium lights and light poles. A resident was then employed to report burned out lights because the housing authority employees were usually gone before dark.

By the end of 1995, robberies were down 73 percent, felony assaults were down 74 percent, and narcotic calls were down 94 percent. During the 4 years, all calls for service were

down 64 percent—a reduction translating into 1,499 fewer calls for service in 1995 than in 1992. Also reduced were fire department calls (down 36 percent) and suspensions from the elementary school adjacent to the area (down 85 percent). By April 1994, a *Sacramento Magazine* survey of 1,000 members of the Sacramento Association of Realtors resulted in the area being voted "Most Improved Neighborhood." A 1995 survey of residents found improved resident satisfaction, with 80 percent no longer wishing to move from the area.

Projects Whose Main Objective Was to Improve Street Lighting

Isolated examples exist of problem-oriented policing projects more centrally focused on improved street lighting. One project of this kind, called Crime Watch Light Partners, was submitted for the Goldstein Award in 2001 by the Henrico County, Virginia, Division of Police. Involving only one street in Lakeside, populated by 142 homes, it was undertaken in response to resident requests for improved street lighting to deal with larcenies involving automobiles. The project was led by a community officer who spent much of his time (141 hours) working out the details of paying for the street lighting. Streetlights in Henrico County are not installed by the county authorities, but by the local power company, which at the time charged homeowners $96 or $144 a year per light installed (depending on lumens). Because this charge was too high for most residents, the community officer devised a plan whereby four neighbors would share the cost of one new light. He succeeded in getting 112 residents to sign up for 30 new streetlights, which were installed at a substantial saving. Before and after measurements taken with a light meter showed that street illumination was substantially improved, but no data were presented concerning the impact of the improved lighting on crime.

A second project, Gray Street Lights, was submitted for the Tilley Award in the United Kingdom in 2005. This project was undertaken in Workington, West Cumbria, and again was mounted to deal with nighttime thefts from parked cars. Analysis showed that Gray Street was the primary hot spot for thefts from cars in West Cumbria. The street is approximately 300 yards in length, with 90 small row houses on either side of the road and several small businesses at one end. During 2002, 27 thefts from vehicles parked in the street were reported with an estimated total loss of £5,000 (a little under $9,000). Most of these thefts occurred on weekend nights. Analysis of the problem identified poor street lighting as an important contributory cause of the thefts. Other presumed causes were the lack of private garages and off-street parking and the fact that the street was a busy pedestrian route after pub closing time.

The police established that a significant upgrading of the lights in the street would cost £14,000 (about $24,500) and coordinated a successful bid for government funds to pay for the lights. These were installed in December 2003; in 2004, only six thefts from cars were reported in the street, at an estimated cost of £833 (about $1,500). Clearly, this was a significant improvement from the situation in 2002, before the lights were upgraded. A survey established that residents believed the new lights had reduced crime and that they felt safer in the street.

Summing Up

Improved street lighting has rarely been the main objective of a problem-oriented policing project, but where it has, it seems to have been effective. In fact, most improvements in lighting have been made in the course of projects that aimed to rehabilitate deprived and rundown neighborhoods with serious crime and disorder problems. Because the lighting improvements were usually a relatively minor part of the project, it is impossible to know what part, if any, they played in the claimed reductions in crime or improvements in community satisfaction—which were often quite spectacular.

What Are the Practicalities of Improving Lighting?

You will face a number of difficulties in trying to improve street lighting; the more ambitious your project, the greater these difficulties will be. Trimming bushes so that lights are more efficient and replacing damaged or dysfunctional lamps will usually be straightforward, but upgrading the lighting for an entire neighborhood will entail much more difficulty. You will have to grapple with cost issues, technical issues relating to different kinds of lighting, municipal regulatory and zoning projects, and various objections raised by residents.

§A variety of state and federal programs exist that provide funds for qualifying street lighting projects within cities and municipalities, especially for projects that improve energy efficiency (see NYSERDA, 2002). Your help in identifying these sources might be needed.

How Much Will It Cost and Who Will Pay?

Cost issues will depend upon who has the responsibility for installing, maintaining, and paying for lighting in the area. Many or most municipalities are responsible for street lighting, which is expected to meet citywide standards in different neighborhoods or districts. In these cases, you will be relieved of the need to understand most of the complex technical, financial, and logistical issues of upgrading the lighting. The same is likely to be true if your area is a public housing project, because physical conditions for U.S. Housing and Urban Development properties must comply with state and local codes.

Whatever the regulations governing street lighting, you will still need to work closely with city officials and engineers to persuade them of the need to upgrade the lighting in your neighborhood, or at least to accord priority to the neighborhood. You will need to advise the engineers of the particular places that need special lighting or lighting of a particular kind, although you will need to recognize that—even with the best will in the world—engineers will be limited by lighting standards and budgets§ in what they can do: they have a delicate balancing act to perform in providing adequate

lighting at minimum financial and social cost. Financial decisions must weigh the costs of installation, maintenance, and electricity. The long-term costs of electricity are especially important at a time when some smaller towns are reportedly dimming sections of their streetlights in the face of rising costs and the pressure to be energy efficient.[8] Social costs include the unwelcome effects of glare, light trespass, and light pollution, which vary with different kinds of lighting (see below).

You will also have to play a part in keeping the project on track. You should monitor progress closely during the approval and implementation stages, remembering that you can play an important role as liaison between the municipality and the utility company to ensure that unnecessary delays are avoided. However hard you work, you should be prepared for many months to elapse before the project is complete.

The problems might be different, but equally difficult, if your area is located in a suburban or predominantly rural area. In these areas, utility companies sometimes own and maintain the street lighting and under certain budgetary conditions might pay the initial cost of renewal or improvement of the street lighting. In some cases, they might be able to recover the cost from the municipality, but in others they might have to charge residents. This was the case in the Crime Light Partners project described earlier. As in that project, the main difficulty lies in obtaining the agreement of residents to pay for the improved lighting—a difficulty that can be particularly acute in deprived and rundown neighborhoods where lighting has never been adequate or where it has severely deteriorated.

Selecting Appropriate Lighting

As a police officer, you cannot be expected to know what specific type of lighting improvements are needed, nor can you be expected to know all the various standards and requirements of street lighting. But you will be able to communicate better with utility companies and the local engineering department if you have some basic understanding of lighting types and their properties. These are described here.

§For fuller information on lamp types, see NYSERDA (2002b).

1. ***Lamp types or bulbs:*** There are six main kinds of lamps (see Table 3), which vary in their initial costs, how long they last, how energy efficient they are, and how well they render color (i.e., the effect of the light produced by the lamp on the perceived color of objects being viewed).§ Your local utility companies might not supply all these types of bulbs.

Table 3: Common Street Lighting Lamp Types.

Lamp type	Properties
Incandescent (bulbs)	Very energy inefficient, short life
Mercury Vapor (MV)	Energy inefficient, longer life
High-Pressure Sodium (HPS)	Energy efficient but virtually no color rendering (orange glow)
Low-Pressure Sodium (LPS)	Very energy efficient, but only limited color rendering
Metal Halide	Energy efficient and good color rendering, especially pulse start or ceramic metal types
Fluorescent	Energy efficient and good color quality, but poor optical control

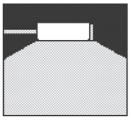
Source: Adapted from NYSERDA (2002a)

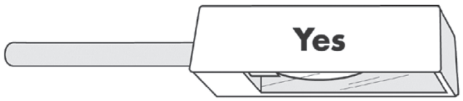
2. ***Color rendering:*** Color rendering refers to the effect of light on the perceived color of objects. Good color rendering means that most colors are easily distinguishable and is particularly important when color video cameras are in use. Color rendering should be distinguished from color appearance, which refers to the color of the lamp itself.
3. ***Optical control or lighting cut-offs:*** Optical control refers to the light distribution of different lighting fixtures, of which there are four main types.
   - **Noncutoff** optics, typically globes, allow light to be emitted in all directions. Many decorative fixtures are of this type. They are effective at throwing light up into trees, not onto the ground, and they create a large amount of light pollution and glare.
   - **Semicutoff** optics are commonly used in cobra-head style street lighting. They allow most of the light to shine on the ground, but some light is thrown upwards. There is significant glare from these fixtures, but they are often mounted on taller poles to reduce the ill effects of glare.
   - **Cutoff** optics are typically rectangular in shape and produce more controlled lighting than semicutoff: less than 2.5 percent of the light is allowed to escape upwards. They offer a wider spread of light than a fullcutoff and are commonly used in parking lots where greater spacing between poles is desirable.
   - **Full cutoff** optics put light on the ground in a defined, tight pattern; they do not emit any light upwards. To achieve uniformity of lighting, more of these fixtures must be used, or they must be mounted higher off the ground.

4. ***Brightness of lighting:*** Lighting engineers measure either the brightness (luminance) or quantity (illuminance) of light at the illuminated object (e.g., the ground) and also the light emitted from the source (i.e., the lamp).
   - **Candlepower** is the luminous intensity of a source of light in a given direction. Now expressed in candelas, it was formerly measured in terms of the international candle.
   - **Lumens** are the metric unit of luminous flux, i.e., the time rate of flow of light from a lamp.
   - **Foot-candles** are a measurement of the light falling on a specified surface (e.g., the ground). This is illuminance in lumens per square foot.
   - **Lux** is the metric equivalent of foot-candles: lumens per square meter.
   - **Candelas** (per square foot or per square meter) is a measurement of brightness or luminance.
5. ***Pole spacing and height of lights:*** It should be clear from the above that the cutoff properties of different light fixtures will partly determine the number and height of street lighting poles that are needed to illuminate a given area. This in turn has implications for costs and for glare, light trespass, and light pollution (see below).
6. ***Vertical illumination:*** Vertical illumination is the measure of light delivered at a sufficient height from the ground so that people can see the faces of other pedestrians. Areas suffering from high levels of street crime and robbery benefit from high values of vertical illuminance.
7. ***Glare, light trespass, and light pollution:*** Glare, trespass, and pollution are potential dangers from increased lighting. Careful selection and design of street lighting can minimize their effects.

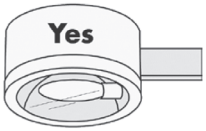
- **Glare:** A well-designed street lighting system directs light to the road surface and pedestrian areas, but not into the eyes of motorists and pedestrians. Glare can be minimized through proper fixture selection, pole placement, and light source selection.
- **Light trespass:** Unwanted trespass of light falling onto adjacent properties can lead to complaints from residents. An effective system limits streetlights from shining light where it is unwanted, such as into windows on private property.
- **Light pollution:** Light pollution is defined as unwanted light in the atmosphere that contributes to sky glow. Many localities and states have passed laws to minimize light pollution, and many more laws are pending. Full cutoff fixtures that only direct light downwards to the ground have become popular, although careful design is required to minimize the amount of light reflected off the ground and into the sky (see box).

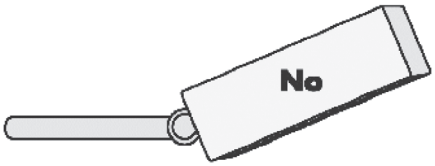
What is a True "Full Cutoff" Outdoor Lighting Fixture?





Flat glass lens, eliminates or minimizes direct glare, no upwared throw of light. The housing for these fixtures is available in many styles.





Same fixture as above mounted incorrectly - defeating the horizontal mounting design. The fixture now produces direct glare, and can also produce uplight at steeper mounting angles

Known as just "Cutoff". Center "drop" or "sag" lens with or without exposed bulb, produces direct glare.

Forward-Throw Style. Exposed bulb in the forward direction produces some direct glare.

Source: International Dark-Sky Association (IDA Inc.), www.darksky.org.

Reproduced with the permission of IDA Inc. and Bob Crelin.

Dealing with Objections Raised by Residents and Others

Improvements in street lighting are much less controversial than some other crime-prevention measures covered in the *Response Guides* series, such as street closures[9] or the installation of video surveillance cameras or CCTV.[10] It is a fact of human nature that we resist change, and thus even improvements in street lighting—which carry many benefits—will be resisted by some community members and public officials.

Residents in your neighborhood. You should expect some neighborhood residents to oppose proposed improvements to street lighting, especially if they are expected to contribute to the cost. But you can also expect a variety of other objections. Some residents might be concerned about glare, light trespass, and light pollution, particularly if a streetlight is to be installed close to their homes. Some might be concerned about the disruption, dirt, and inconvenience that will result from the installation. Others might complain that improvements in lighting are being used as an unsatisfactory alternative to increased police patrols. Yet others might see the improved lighting as a stigmatization of their neighborhood. Finally, some residents involved in street drug dealing might regard the lighting improvements as an effort by officials to disrupt their livelihood.§ For obvious reasons, this concern will not be voiced, but it might underlie opposition based on other grounds.

§In some instances, new lights are shot out by drug dealers or vandals. Shields to guard lights from gunshots can be purchased.

Dealing with these and other resident concerns is an essential part of consensus building and an essential aspect of your community policing role. You can try to do this through town meetings, one-on-one discussions with residents, meetings with local elected officials, and interviews with the media. Even if the worries seem exaggerated, you must take them seriously and address them directly. You can be helped in this by the

neighborhood residents' association (if one exists), but expect the process to be time-consuming. You might need to meet many times with the association leaders and other community leaders. These and other meetings should be open to all residents.

Without a residents' association, obtaining a general agreement can be even more difficult, as there is likely to be no one group or person who is empowered to make community decisions. You might find local elected politicians helpful, but beware of self-appointed community leaders who might simply be pursuing their own agendas.

It is essential that you are well-prepared for meetings. You should present data showing the proportions of crimes of different types committed by day and by night and be prepared to discuss the limitations of alternative ways (such as increased patrols) of dealing with these problems. You will need large maps showing where new lights are needed and where lighting upgrades are required. You should bring pictures of the types of lights you are planning to install. Finally, you will need to be familiar with the research studies on the effectiveness of improved street lighting and the findings on displacement and diffusion.

Each meeting should have a written agenda and should conclude with a review of the proceedings, including what actions have been agreed on and who is responsible for implementing them. If possible, you should set the time and place for the next meeting while everyone is still present. Communicating a sense of urgency to all the participants is critical to keeping up project momentum.

You must be very open and clear in your approach. At all costs, avoid giving the impression that all the important decisions have already been made and that consultation is merely a formality. Be open to alternative ideas about the placement of new lights or the type of lights to be installed. Engage stakeholders who are reluctant to participate in the discussions and consider the needs of resident groups such as children and teenagers, who might not be adequately represented at the meetings. Finally, it is very important that you persuade your superiors to let you remain at your post until negotiations are concluded and an agreement has been reached. The success of such a process depends on the trust developed between you and the other stakeholders. Nothing is more fatal to a problem-oriented project than a change of police leadership at a crucial point.

Nearby neighborhoods. Complaints from residents of nearby neighborhoods are like to be of two main types. First, residents will wonder why the lighting in their neighborhoods is not being improved. Second, residents will express concern that crime and hooliganism will be displaced into their neighborhoods. These concerns might be publicized by the local media and echoed by local elected officials. Again, you should meet with residents and local elected officials to find ways of allaying these concerns. In dealing with the media, try to involve local elected officials, provided that they support your proposals. You can be sure that they will welcome the chance to appear on television or in the newspaper.

City Officials. Local officials will need to be satisfied that your proposals to improve street lighting are grounded in data showing that the neighborhood has unusually high rates of crime that can be reduced by improved lighting. Your task will be much more difficult if you do not have the support of local elected officials; thus, you will need to plan carefully to engage their interest and assistance.

Your Checklist of Tasks

There is no published step-by-step guide on how to improve street lighting to reduce crime and, in any case, every problem-oriented project is unique. You will have to tailor general guidelines to your own situation to produce an action plan. Answering the questions below will help you do this.

The amount of work you will need to do to personally to ensure the project's completion will depend crucially on whether the local government supplies a project coordinator: you should do your best to persuade the responsible officials that a project coordinator is vital. Impress upon them the need for government oversight and accountability. You can then work with whoever is appointed, knowing that the responsibility does not rest entirely on your shoulders.

Analyzing the Problem

- Have you clearly defined the neighborhood boundaries?
- Have you collected reliable data about the types of crime and disorder that are the focus of concern?
- Do you know the proportion of crimes committed by day and by night?
- Do you know whether these crimes are committed by local residents or outsiders?
- If outsiders, do you know whether they go to the neighborhood specifically to commit crimes, or whether they do so when visiting or passing through?
- Can you document that the lighting in the neighborhood is seriously deficient?
- Have you estimated how much crime improved lighting will prevent?

- Have you clear expectations about how improved lighting can reduce crime? For example, by enabling witnesses to see offenders and report incidents to the police? Or by raising the fear in the minds of offenders that this will happen?
- Have you explored alternatives to improved lighting, e.g., video surveillance, neighborhood watch, crackdowns, crime-prevention advice?
- Can you explain why these alternatives cannot adequately substitute for improved lighting?

Formulating a Plan

- How many new lights are needed?
- How many existing lights must be upgraded?
- What type of lights will be installed?
- Where will the lights be located?
- If video cameras are in use in the neighborhood, will the improved lighting affect the quality of their operation?
- Might improved lighting in some places encourage undesirable behavior? For example, might lighting a rarely used footpath increase opportunities for victimization?
- Will the lighting selected produce adequate levels of vertical illumination so that people can see the faces of others clearly?
- How much will the new lighting cost?
- Have you obtained the agreement of any residents who will be required to pay for the improvements?
- How long will it take to install the new lighting once agreement has been reached?
- Who will install the new lighting?

- Is there a detailed plan showing which trees and bushes need to be trimmed?
- Who is responsible for trimming the shrubbery?

Getting Support

- Do you have support from police district commanders, the chief, and other key city officials, such as the lighting engineer?
- Do you have a clear mandate from residents and elected representatives?
- Are residents content with the appearance and location of the new lights?
- Have you dealt adequately with individual concerns about light trespass?
- Can you answer any worries about light pollution?
- Have you allayed resident concerns about neighborhood stigmatization?
- Have you dealt with the worries of nearby communities about displaced crime?
- Have you briefed the local media about the need for improved lighting?
- Have you dealt satisfactorily with public opposition?

Implementing the Plan

- Has a municipal project coordinator been appointed?
- Have you constructed a detailed timeline showing when each element of the improved lighting program will be started and completed?
- Does this plan include both approvals and actions?
- Are all parties informed about and in agreement with this timetable?

Assessing Effectiveness§

§See Eck (2002) for help with assessing effectiveness.

- Are you prepared—do you have the necessary data—to be able to compare neighborhood crime or disorder before and after the lighting has been improved?
- Will the before and after periods be directly comparable? For example, will you be able to control for time of year?
- Will you be able to compare the proportions of crime committed by day and by night?
- Will you be able to compare before and after crime trends in your neighborhood with those in nearby neighborhoods?
- Will you examine possible displacement and diffusion?
- Will you try to estimate if improved street lighting is cost effective?

Conclusions

It is clear that reductions in crime can be achieved by improvements in street lighting and that these reductions will be most worthwhile in high-crime neighborhoods. It is also clear that improved lighting can reduce crime during the day and at night. This suggests that improvements to lighting not only act as a situational deterrent to crime, but can also improve local community cohesion and pride, which in turn increases the willingness of residents to intervene in crime or cooperate with the police. Improved lighting will also send a message to potential offenders that the neighborhood no longer offers easy opportunities for crime.

Unfortunately, the available research does not answer every question a police officer will confront in a project designed to improve lighting. There is still a considerable need for the exercise of professional judgment at all stages of such a project, but submissions for the Goldstein and Tilley awards include many success stories where police have worked with communities and local officials to improve lighting.[11] Altogether, it can be concluded that when used judiciously "improved street lighting has few negative effects and clear benefits for law-abiding citizens."[12]

Endnotes

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Ronald Clarke is University Professor at Rutgers University and Associate Director of the Center for Problem-Oriented Policing. He was previously head of the British Government's Criminological Research Department, where he had a significant role in the development of situational crime prevention and the British Crime Survey. Dr. Clarke is the founding editor of *Crime Prevention Studies,* and his publications include *Designing out Crime* (HMSO, 1980), *The Reasoning Criminal* (Springer-Verlag, 1986), *Situational Crime Prevention: Successful Case Studies* (Harrow and Heston, 1997), *Superhighway Robbery: Preventing E-Commerce Crime* (Willan Publishing, 2003), *Become a Problem Solving Crime Analyst* (U.S. Dept of Justice, 2005) and *Outsmarting the Terrorists* (Praeger, 2006). He was formerly chair of the selection committee for the annual Herman Goldstein Award for Excellence in Problem-Oriented Policing.

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December 2008

e120816179

ISBN:1-932582-91-6