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Best Practice Enhancers for Security in Urban Regions

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EXECUTIVE SUMMARY

Objectives

The objective of this report is to review relevant indicators, managerial practices, aids, workflows and other methods for urban security enhancement, and to identify those which are most valuable for the BESECURE urban data platform, the inspirational platform, and the policy support platform. This includes the identification of indicators that can be used to set up a metric for urban security.

Description of the work

What are the most essential elements in a comprehensive approach to the enhancement of urban security? With this question in mind this report reviews several instruments, processes and models of crime prevention such as the European Standard to Crime Prevention (EN 14383), Crime mapping services, tools for predictive crime analysis and the concept of social efficacy. The report concludes with recommendations about which of these practical tools can be used within the BESECURE framework and how to proceed with them.

Results and conclusions

From the overwhelming supply of instruments and tools in the domain of urban security and crime prevention, some are particular useful for BESECUR's objectives:

The evidence-based policing matrix is an online tool that links research to practice. It provides a useful structure for the policy support platform and the inspirational platform. It is comprehensible, easy to develop, and presumably helpful for the user.

Some of the instrument presented in the chapters on crime mapping services and predictive policing, can be used to develop the urban data platform.

Security metrics such as the Amsterdam and Rotterdam Safety Index are reasonable approaches to measure urban security through a mix of relevant indicators, including police recorded crime, urban data, and survey data about social cohesion and fear of crime.

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Coordinator:
Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek – TNO
Kampweg 5
P.O. Box 23
3769 ZG Soesterberg, The Netherlands

Partners:
TNO, The Netherlands
University of Ulster, Ireland
Fraunhofer, Germany
Albert Ludwigs University, Germany
Itti, Poland
The Stephan Lawrence Charitable Trust, UK
Downey Hynes Ltd, Ireland
JVM, UK
Crabbe Consulinting, UK
Consiglio Nazionale Delle Ricerche, Italy
Universita degle Studi Mediterrane, Italy
Experian, The Netherlands
Stichting dr. H. Verwey Jonker, The Netherlands
Erasmus University, The Netherlands

Coordinator contact:
[redacted]

1. Introduction

How to BE SECURE? Managing urban security is a complex task ranging from short tactical decision making to long term strategic visions. On each decisional level there are various tasks involved in order to find a sound basis for actions to be taken. This report presents corresponding tools and aids involved in this process.

BESECURE covers different, but not all areas within the domain of urban crime prevention. Chapter 2.1 of this report illustrates nine sectors of crime prevention and gives the reader a quick impression for which of these sectors BESECURE can be relevant. A manager of a correctional facility may be less interested in the BESECURE urban policy platform than a member of the city crime prevention council. A neighbourhood manager may find the policy support platform more useful than a forensic psychiatrist. Urban planners, municipalities, public transport manager, police departments, and crime prevention councils can use BESECURE as an inspirational tool and a managerial aid. Some European cities have developed systems to assess, improve and maintain urban security such as the Rotterdam Safety Index or the risk assessment system in the city of Lucerne, to name just two examples. Especially those cities who want to develop their own innovative approach to urban security can benefit from the tools, instruments, and concepts discussed in this report. Its recommendations and appraisals are meant to inspire and encourage the reader to design new approaches, or to rethink old ones. This report does not articulate directives or prescriptions, but provides background information in order for the user to articulate them on their own.

This promotes the use of indicators and process models in the management of urban security. Part two of this report reviews different existing *technological regimes*[1] for the enhancement of urban security and explains, against this backdrop, the use of indicators for managerial purposes. Part three suggests that there are three essential ingredients to the approaches presented in chapter two: Crime data, socio-spatial indicators, and survey data. Part three also discusses the concept of collective efficacy, its relevance to crime reduction, and how to measure it.

Crime prevention in Europe has a long lasting tradition and although there are remarkable national differences in the cultures of crime prevention and urban security (e.g. whether or not communal crime prevention is statutory) there is also some common ground. Policies and ideas have evolved steadily over the last decades. Considering the thriving landscape of professional crime prevention initiatives, think tanks, networks, online tools and IT products, the relevant question is: “What inno-

[1] Technological regimes organize and restrict development in a particular domain, such as urban security: “In so far as engineers and firms share similar routines, these form a *technological regime.* Technological regimes result in *technological trajectories*, because the community of engineers searches in the same direction*”* (Geels 2002: 1259). “A technological regime is the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artefacts and persons, ways of defining problems; all of them embedded in institutions and infrastructures” (Rip and Kemp 1998: 340).

vation can BESECURE add to this?" To make it clear from the beginning, this report does not present any novel approaches to crime prevention. It rather assists practitioners and policy makers to select the most relevant ingredients from the seemingly oversupplied market of security tools, and thereby to enable them to develop their own innovative approaches for securing cities against crime.

2. Urban security and crime prevention

To understand how security in urban areas is efficiently maintained one has to look at the wide range of professional practices carried out to this end. These practices come under different labels which essentially mean the same thing (Edwards et al. 2013): 'urban security', 'urban safety', 'community safety', 'crime prevention', 'integral security' control deviant, criminal and anti-social behaviour by ways and means considered appropriate by the stakeholders who implement them. This report refers to the notion 'urban security' and 'crime prevention' interchangeably, designating efforts to control crime.[2]

The maintenance of urban security is an inherently political endeavour meant not only to appease some constituency but also to maintain the social order and the state's monopoly of force at its most visible front: the public space. As all political action, crime prevention is not always driven by evidence and 'scientific rationality' but also by political programmes, ideology, political necessities, budget restrictions, state law, the public opinion, or directives from above.[3] Nevertheless knowledge-based crime prevention is important to effectively manage urban security.

So what is actually being done to achieve this goal? Actions range from single measures such as installing alley gates, to implementing full-blown governmental crime reduction programmes. Although it is not feasible to make an inventory of all the actions taken to reduce and prevent crime, there are patterns all preventive measures have in common and which leave us with nine conceptual categories of possible crime interventions.

2.1. Nine sectors of crime prevention

Crime interventions differ in their level of proactivity. They can address the long term social root causes of crime; they can address more immediate crime risks; or they can reactively mitigate the consequences of crime. Criminological literature describes these different stages of crime prevention as primary, secondary and tertiary crime prevention (Kube 1987). This distinction (originally made in preventive healthcare) was introduced by an early pioneer of crime prevention in Germany, Edwin Kube the former head of the research and development division of the German Federal Criminal Police Office (BKA KI) and is nowadays an established expression in the terminology of crime prevention practitioners and researchers. All three types of crime prevention can address the offender, the situation, or the victim. Accordingly there are nine categories (or sectors) of crime prevention (see Table 1).

For the purpose of this report it is important to briefly review these nine principle ways and means to approach crime-related urban insecurities because for each of the nine sectors there are specific

[2] See BESECURE deliverable D1.1 (page 10) for disambiguation of the terms safety and security.

[3] For an extensive discursive analysis tradition on urban security practices in the Foucauldian see Svenonius (2011).

requirements of data, methods and indicators. A risk assessment of an urban area requires data other than a risk assessment of individual behaviour (for a similar taxonomy see RAND 2013: xiv).

Some crime prevention measures cut across two or more sectors. However for every single sector

Table 1: Nine sectors of community crime preventions (referring broadly to Heinz 2004:3)

dimension / target of the measure	primary prevention (long term, disperse proactive)	secondary prevention (short term, targeted proactive)	tertiary prevention (reactive)
offender	population based	at-risk offender	convicted offenders
situation/location	public space	at-risk situations/locations	hot spots
victim	population based	at-risk victims	actual victims

Relevancy of BESECURE for this sector: high, medium, low

there is a corresponding set of indicators that give a basic impressions of what ingredients to look for when designing new approaches or rethinking old ones.

Primary prevention is a description for long-term population-based measures against crime and delinquency. It is addressed to the population as a whole and from all different preventive approaches it is the one that is most remote to the crime incident as such. Primary crime prevention has a dispersed and long-term effect and it is therefore hard to evaluate whether or not the desired effects have been attained. The delayed and dispersed impact of primary crime prevention might make it less attractive to those policy makers who look for quick wins and symbolic action, but sustainably low crime rates in large social aggregates can only be achieved through primary crime prevention addressed at potential offenders, victims, and the public space.

The general deterrent effect of criminal punishment affects all members of a society equally no matter if they ever commit a crime or not. Whether harsher sentences have a preventive effect or not is a contested question, more often than not won by those who negate this claim. All the same, criminal punishment also has a non-deterrent and rather symbolic preventive effect: it conveys the message that a moral wrong has been committed and that society is not indifferent about it. In the very first place law-making and law enforcement has the objective to maintain the volatile equilibrium of justice in a society. If primary prevention fails, all subsequent preventive measures are futile because then they treat the social symptoms of crime rather than its causes.

Primary prevention also operates proactively on the victim-level, that is, before someone actually has become a victim to crime. The example at hand is the idea of actuarial justice (Feeley and Simon 1992). “[A]ctuarial techniques are used to produce insurance percentage rates needed to establish premiums to cover expected losses and expenses” (Robert 2007) caused by crime. Actuarial justice

departs from the fair assumption that crime can never be prevented entirely and therefore its inevitable, harmful consequences should be mitigated as best as possible. Actuarial justice is not prevention in the strict meaning of the word, but all the same it is proactive as it provides security against crime before it has happened.

Whereas these two types of primary crime prevention (actuarial techniques and general deterrence) have only limited applicability on the city level, policy makers and urban planners can apply primary crime prevention in the public space and in the architectural landscape of the city. The long-lasting idea of "designing out crime" means to avoid the architectural preconditions of crime through deliberate planning. "A great number of experiments have shown that particular types of crime can be reduced by modifying the opportunity for crime in the built environment. Moving the night-time tavern crowd away from vacant storefronts after closing time will inevitably reduce the number of burglaries and vandalism incidents to the stores." (ENV 14383-2:2003: 5). The European Standard on "prevention of crime – urban planning and building design" stipulates this particular approach to urban security, and it is presented in greater detail in the next section of this report.

Secondary prevention is more promptly related to the perpetrator, location or the victim of crime in that it only targets objects that are at risk. Many, if not most forms of secondary crime prevention are not implemented by the authorities, but by individuals or private companies who secure their property, or take measures for personal defence. Target hardening, or personal protection through a bodyguard are examples of how secondary crime prevention is applied by private actors. Because security is costly, risk assessment can help to use most efficiently resources in the private and public sectors.

A prerequisite of secondary crime prevention therefore is knowledge about whom or what is at risk, and to what degree. Policy makers and practitioners can draw from criminological, forensic, psychological, and sociological research to this end. Studies in these domains have identified hundreds of "correlates of crimes" (Ellis 2009), and revealed intriguing findings about criminal biographies and careers (Farrington et. al. 2006, Moffit 1993, Sampson and Laub 2003) as well as criminal decision making (Katz 1988). However, the sheer volume of available information sometimes appears to be an obstacle rather than an advantage for urban policy making. It is not surprising that crime prevention practitioners often rely on their immense professional experience and tacit knowledge rather than on academic research: streetworkers, school councillors, and social workers know their clients well and use a wide repertoire of preventive measures and programmes to reduce the risk of individual offending. The purpose of the BESECURE approach is to synthesize as much relevant research and as many best practices as possible into a comprehensive knowledge base.

Tertiary prevention describes reactive measures to prevent reoffending, repeated victimisation and measures to reduce crime rates in established hot spots. Again, for each type of prevention there are corresponding instruments for risk assessment: Forensic-psychological scales such as FORTES (forensic operationalised therapy-risk-evaluation system) or LSI-R (Level of Service Intervention – Revised) use a large repertoire of underlying indicators and scales to assess the risk of individual criminal behaviour, reoffending and recidivism. *Selective Incapacitation* is a highly controversial criminal policy that seeks to incapacitate crime prone individuals, e.g. by three strike legislation and

mandatory minimums in sentencing. In regard to the place of crime, crime mapping applications visualise the spatial distribution and clustering of past crime incidents in order to make predictions about their trend. Section 3.2discusses which elements of crime mapping and predictive policing can be utilised within the BESECURE process.

From this brief overview it becomes clear that a holistic crime prevention strategy is a complex task spanning different governmental domains and their corresponding professional fields (such as education, criminal justice, social work, probationary service, policing, and city planning). The nine sectors of crime prevention illustrated in Table 1 are not mutually exclusive. Some preventive measures cut across two or more of the nine categories, for instance measures that address at-risk offenders together with the local setting they live in. Neither are the nine areas of crime prevention equally relevant on the municipal decision-making level. A city is not a closed social and political system and is therefore susceptible to all kinds of influences from the wider political, economic, and cultural environment that affect its security. Conversely, a city has limited impact on its larger environment, for example to influence national legislation in regard to criminal law (but of course it can enforce this law more or less strictly). This is not to deny that cities can establish a distinctive security culture. The most shapeable fields of urban crime prevention are primary prevention in the public space, secondary prevention of at-risk-offenders, situations and victims, as well as tertiary prevention in crime hot spots (see Table 2).

The nine categories of urban security and crime prevention provide a minimalist overview of the multitude of disparate measures which often have little else in common than their engagement with “urban security”. The “evidence-based policing matrix” (Lum, Koper, Telep 2010) takes this typology a step further. It is an important tool that works as an interface between research and practice. It is discussed further in Section 3.3of this report.

Whereas the nine sectors provide a rather analytical picture, more policy driven distinctions set apart different approaches according to their ideological provenance: e.g. restorative justice vs. criminal justice, social policy vs. risk management (see Edwards et al. 2013: 271). In a recent study by the EU URBIS project, urban security policy makers (panel 1) and criminologists (panel 2) where asked through a Delphi panel about the meaning of “managing urban security”, “the problems of urban security” and “different approaches to managing these problems”.

One of the key findings of the study is that “Crime prevention rather than urban security remains in fact the more commonly used term in policy discourse in Europe” (URBIS flyer of ESC conference Eurocrim 2013). Overall the two Delphi panels reported 25 problems and 15 different approaches to address them as the most relevant practices of urban security management (see Table 2). There was considerable disagreement in the panels (both between the two panels and within each of them) about the prioritisation of problems and approaches. However the vast majority in both panels (consensus among three quarters or more of all respondents) reported that “reducing segregation and promoting social cohesion” is of primary importance to urban security (Edwards, Hughes, Lords 2013: 270).

This of course is a rather vague statement which few people are inclined to deny, but it points to an emerging field of urban policy making discussed under the label *collective efficacy* (initially Sampson

et al. 1997, in regard to city planning e.g. Rukus, Warner 2013). Due to its direct applicability and relevance in urban security making, this report describes a tool to measure the degree of social disintegration/cohesion in different areas of a city (see Section 4.3).

The study of Edwards et al. also shows that policy makers in the European Crime Prevention Network (EUCPN) evaluate risk management approaches as an important managerial tool for the prevention of some crimes (in particular violence and property crimes) but less so for other types of crime (e.g. alcohol misuse and ASB) (see Figure 1 in the annex). Bearing in mind this result, this report considers risk management as a process to enhance urban security. Risk management is a highly adaptive process and therefore applicable within the different fields of crime prevention. Within an established context it proceeds in four straightforward steps: identification, analysis, evaluation, and treatment. These steps can be taken to manage the risks of different crime related events. At the analytical stage it can assess the risk that an individual becomes deviant, or that he or she becomes a victim of crime. It also applies to the situation and location of crime incidents: what is the risk of crime occurring in a certain location? How vulnerable/resilient is a certain urban location to particular crime types, and so on.

Notwithstanding which security approach, or which combination of approaches one takes, it all starts with a thorough analysis of the status quo. The next chapter reviews three established crime prevention regimes that all promote the use of indicators, namely the European Standard on urban crime prevention EN 14383, Predictive Policing technologies, and the matrix of evidence based policing. The last chapter proposes three essential ingredients for thorough crime analysis and urban security risk assessment: *survey data* on social cohesion, collective efficacy and fear of crime; *police registered crime;* and *socio-spatial indicators*.

Table 2: Problems and approaches of urban security identified in a Delphi panel composed of criminologists and crime prevention practitioners (Edwards, Hughes, Lords 2013: 268).

Problems	Approaches
1. Incivility and anti-social behaviour 2. Drug trafficking 3. Property crime (burglary, theft, robbery) 4. Criminal damage (vandalism, graffiti) 5. Fraud 6. Violence against the person (including domestic violence) 7. Alcohol and drug misuse 8. Firearms-related crime 9. Environmental degradation (e.g. illegal waste disposal, pollution) 10. Knife-related crime	1. Enforcing the criminal law 2. Reducing social segregation and promoting social cohesion 3. Repressing incivility 4. Increased use of imprisonment and correctional facilities 5. Use of CCTV surveillance 6. Reassuring citizens about their security and about their fear of crime 7. Reducing the opportunities for criminal victimization 8. Reducing social inequalities in household income, access to education, employment, healthcare and

11. Criminal gangs and organized crime 12. Human trafficking 13. Prostitution, illicit sexual services 14. Corporate crime, including corruption 15. Health and safety in the workplace 16. Corruption of public administration 17. State police violence 18. Terrorism 19. Tax evasion 20. Climate change and natural disasters (flooding, extreme weather) 21. Protection of critical infrastructure (water and food security, transport and communications systems, energy grids) 22. Immigration and social cohesion 23. Mass demonstrations and civil unrest associated with austerity 24. Social exclusion and youth unemployment Degradation of governing capacity through public expenditure	housing 9. Preventing the onset of offending behaviour and incivility 10. Punitive sentencing policies 11. Requiring citizens to take responsibility for their own security and equipping them with the capacity and resources to meet this responsibility 12. Restorative justice interventions with perpetrators and victims of criminal offences 13. Celebrating social diversity and promoting the rights of minority groups 14. Enhancing the democratic scrutiny and oversight of security strategies 15. Promoting greater health and safety in the workplace

3. Approaches to crime prevention

3.1. European Standards on "Prevention of crime - Urban planning and building design

The European Standard "Prevention of Crime – Urban planning and building" (hereafter EN 14383 or "the standard") is a blueprint for stakeholders to enhance security of urban regions. It a comprehensive aid for planning, managing and orchestrating crime prevention through urban design. The standard sets out a detailed technological regime for the enhancement of urban security (actual and perceived) following the guide of prescribed and harmonised steps of action, including a risk management process (see Figure 7 in the annex for the flow chart). This process leads the user in seven steps from identification of a crime problem to the selection of adequate approaches taking into account relevant context information. What appears to be a black box at first glance is a complex decision making tool, currently containing one European Standard (CEN/EN 14383-1), four technical reports (CEN/TR 14383-2/5/7/8) and two technical specifications (CEN/TS 14383-3/4) (see Table 3). [4]

The standard originates from the work of Technical Committee (TC) 325, initially assembled in 1996 to formulate a European Standard for the reduction of crime and the fear of crime by urban planning and building design. The initiating countries were Netherland, Belgium, Denmark, France, Norway, the United Kingdom, Sweden and Austria (Weicht 2003: 9). One of the early initiators was Paul van Soomeren who today is the regional director of the International Crime Prevention Through Environmental Design (CPTED) Association.

Table 3: CEN/TC 325 - Published standards

Standard reference	Title
CEN/TR 14383-2:2007	Prevention of crime - Urban planning and building design - Part 2: Urban planning
CEN/TR 14383-5:2010	Prevention of crime - Urban planning and building design - Part 5: Petrol stations
CEN/TR 14383-7:2009	Prevention of crime - Urban planning and building design - Part 7: Design and management of public transport facilities
CEN/TR 14383-8:2009	Prevention of crime - Urban planning and building design - Part 8: Protection of buildings and sites against criminal attacks with vehicles
CEN/TS 14383-3:2005	Prevention of crime - Urban planning and building design - Part 3: Dwellings

[4] The European standard follows a rather mechanic process of crime analysis and prevention whereas BESECURE tools are less prescriptive and more flexibly used.

CEN/TS 14383-4:2006	Prevention of crime - Urban planning and design - Part 4: Shops and offices
EN 14383-1:2006	Prevention of crime - Urban planning and building design - Part 1: Definition of specific terms
prCEN/TR 14383-6	Prevention of crime - Urban planning and building design - Part 6: Schools

CEN= European Committee for standardisation
TR = technical report
TS = technical specifications
TC = Technical Committee

It is worth reflecting on the mechanism of the standard with a bit of detail here, because it provides some of the ingredients policy makers may like to consider when designing a comprehensive strategy for urban security. The standard includes *contents* and *processes*. Contents are "strategies and measures [...] to prevent and reduce crime problems in a given environment" whereas "process refers to the question: how to follow an effective and efficient procedure in which stakeholders shall choose the strategies and measures most effective and feasible to prevent and reduce crime problems as defined by the stakeholders" (prCEN/TR 14383-2: 491). The user of standard 14383 takes the following steps:

(1) Identification of the type of urban zone and delimitation of the boundaries of the area (e.g. postal code areas, statistical areas). This sets the general direction of the process because for different types of urban environments (residential areas, city centres, office areas, shopping and retail areas, schools, parking facilities, public transport) there are corresponding process guidelines, assessment tools, indicators and measures (see Table 1 in the annex). The norm distinguishes 16 levels of intervention ranging from small scale to large scale. Function and size of the area determine the level of intervention. Table 10 in the annex gives an overview of these levels, the respective standards that apply to each of them, as well as of some possible approaches and types of stakeholders to be involved.

(2) Identification of the crime problem. The standard provides two tools for analysing scope and extent of crime: a prospective *crime assessment* tool and a retrospective *crime review* tool. The crime assessment is to be applied in the planning of new urban environments. Based on criminological theory and experiences it points planners to potential problems that may emerge as a consequence of planning mistakes. Essentially, the crime assessment tool is a checklist with 77 risk- and protective factors for environmentally induced crimes. These factors relate to offenders, guardians, and victims and are limited to seven crime issues: burglary, vandalism, street violence, car crime, theft, arson, and fear of crime. (Annex 2 shows the complete list).

Unlike crime assessment, crime review is an account of already existing urban insecurities. It suggests a mix of methods to collect a portfolio of information about the physical environment of the area, its socio-economic and demographic features and its crime history. The standard recommends collecting both objective (statistical information) and subjective data (opinions,

fears, and experiences) about crime and provides an extensive practical guide for auditing crime and safety in an urban area.

(3) Identification of the relevant stakeholders. The standard identifies three types of stakeholders who can be involved in the management process: owners (such as the municipalities, public transport, contractors), specialists (such as police, social workers, research consultants), and the residents or users of the setting (ENV 14383-2: 501).

Based on the results of crime assessment (or review) the body develops and implements a feasible and effective strategy or policy together with all relevant stakeholders. The standard describes a set of possible approaches as well as ways and means to evaluate them (but it does not contain a tool for evaluation).

The technical specifications (CEN/TS) and technical reports (CEN/TR) of the 14383 series apply to specific urban environments such as public transport, petrol stations, shops and offices, and schools. There is no room in this report to cover all of them but one additional tool should be mentioned here because it offers an extensive list of indicators for actual and perceived urban insecurities processed through a risk management approach.

CEN/TS 14838-3 describes a risk assessment tool for "reducing the risks of crimes against people and property in dwellings and their immediate surroundings through planning and design" (CEN/TS 14838-3: 5). Planning and design, as recommended in the standard, strictly follows the steps specified in ISO risk management: identification, analysis, evaluation, and treatment. In summary, the standard is an extensive practical guide to target hardening (i.e. physical protection) including more than 50 parameters to determine the threat level of a given object and the appropriate measures to be taken in order to enhance the security of the setting (structured into five action classes). The manual casually names its criminological underpinnings, namely Rational Choice, Routine Activity, and Defensible Space.

Description of CEN/TR 14383-2:2007

CEN/TC 325
"Prevention of crime by urban planning and building design"

"This Technical Report gives guidelines on methods for assessing the risk of crime and/ or fear of crime and measures, procedures and processes aimed at reducing these risks. Design guidelines are given for specific types of environments to prevent or counteract different crime problems consistently with the urban planning documents (see 4.3). Furthermore, guidelines for a step by step process are presented to involve all stakeholders (see 4.4) engaged in urban planning and environmental crime reduction as well as all other stakeholders mainly local and regional authorities and residents in the multi-agency action needed to minimise the risks of crime and fear of crime. This Technical Report is applicable to the planning process of new, as well as existing, urban areas. An area can be the neighbourhood or environment ranging from just a few houses or streets to the whole city with a focus on public spaces."

It encourages the user to look at the territory, design, layout and spatial features of the location through the eyes of a burglar searching for opportunities and weak spots in the urban landscape. Environmental features that influence the risk of crime include vehicular access, lighting, light pollution, footpaths and passageways, letterboxes, emergency exists, layout and location of garages, fences and walls and many others. Modus operandi, experience and resources of the burglar are additional determinants of the overall risk score of an object and the required measures to protect it. Table 4 provides an overview of the general parameter classes and their weighted indicators used in the assessment.

Some parameters are ordinal (e.g. type of offender = (a) opportunist, (b) experienced (c) professional) others are quantitative (e.g. market value of goods in the premises). A weighted score is assigned to each response category in order to make them measurable by some standard metric. The weight depends on the assumed (not further specified) impact of each single indicator on the overall net risk. Instead of statistical validity of the weights the authors of the standard assume face validity. For instance a high level of noise at the setting increases the overall score by nine points whereas low density of area increases it by twelve points. A window not visible from the public area that is accessible by climbing, contributes more to the overall risk score than a window that is also accessible by climbing but is visible from the public area. This weighting system makes sure that target hardening must increase to the degree the object is hidden from public areas in order to keep the threat level constant.

Table 4: Risk indicators (CEN/TS 14838-3:2005: 26-35)

	Parameter class	Weighted indicators:
Parameters for potential significance of burglary	Objective importance of the asset	▪ Market value of goods in the premises ▪ Type of documents in the premises ▪ Irreplaceable goods in the premises
	Subjective importance of the asset	▪ Assessed value of items present in the premise ▪ Seriousness of an intrusion without theft ▪ Most feared kind of aggression
	Type of aggressor	▪ Opportunist-, experienced-, professional burglar, monetary/politically motivated kidnapper
Parameters for potential risk of burglary: individual dwellings	Site and physical environment	▪ Density of the area ▪ Access and road network ▪ Types of access ▪ Immediate vicinity of the dwelling ▪ Presence of landscaping giving visual obstruction ▪ Level of noise in the vicinity ▪ Site adjoins railway line or river or wooded area

	Human and social factors of the environment	▪ Type of development ▪ Type of neighbourhood ▪ Crime history of the area ▪ Neighbourhood relations
	Use of the building	▪ Access and parking close to the dwelling (vehicles) ▪ Access and presence close to the dwelling (pedestrian) ▪ Periods of occupancy
	Physical characteristics of the building	▪ Cellar, basement or attached garage ▪ Accessibility of the roof ▪ roof resistance ▪ size of roof openings
	Windows and French windows	▪ French windows ▪ Accessibility of visible windows and French windows ▪ Windows at rear or not visible from public areas ▪ Shutters/security glazing on easily accessible openings
	External doors	▪ Number of external doors ▪ External doors in concealed areas ▪ Break-in resistance of the weakest external door of the house
	Perimetric and occupant factors	▪ Lighting of accesses ▪ Appearance (4 indicators) ▪ Protection of valuables (3 indicators) ▪ Boundary between public and private space ▪ Access control of visitors

The extensive technical guide is followed by an annex with the required assessment instruments (checklists, parameter scoring sheets, evaluation tables and a cost-benefit checklist of methods to enhance security in residential blocks). The eventual result the user of the standard will get from the assessment, is a table summarising the recommended resistance class (conforming ENV 1627) of security features of locks, doors, windows, glazing etc. (see annex Table 10). The resistance class of a security device informs the user how long it will resist attempts to break it, taking into account the experience level of the burglar as well as the equipment he uses. From a reverse engineering point of view the information given in the table can be exploited by a malevolent user to determine which hardware and techniques are required to breach the security measures of the object under assessment ('dual use'). Possibly entry methods are explained for all six resistance levels, for example, for level six: "experienced burglar uses in addition [to the tools named in level 1-5] more powerful electric tools e.g. drills, jig saw, sabre saw and angle grinder with 230 mm maximum diameter disc" (CEN/TS 14838-3:2005: 22).

3.1.1. *Appraisal of EN 14838 and supplemental security assessment tools*

The European Standard[5] "gives guidelines for assessing the risk of crime and/or fear of crime and measures, procedures and processes aimed at reducing these risks" (prCEN/TR 14383-2: 493). Some may foster the hope that standards can enhance urban security in the same fashion that other standards have revolutionised processes in their domains. Security and crime prevention however have an inherently political nature that may resist the imposition of standards, or may bring about "unintended consequences of different sorts of standards operating in distinct social domains" (Timmermans, Epstein 2010: 69).

As with every standard, the 14838 series does not leave much room for creativity and innovation because it rests on a rather mechanical understanding of the causes of crime and its prevention. To be sure, crime prevention can be that simple: fortify your house and burglars will look for an easier target elsewhere. And if there is no easy target available they might not break into any house at all. Avoid prominent planning mistakes in the design of car parking facilities and you inhibit the number of thefts from cars in this particular area or even in the whole city. At the very least, the standard can raise awareness of the numerous environmental factors that influence crime. It is a strict practical application of defensible space and routine activity theory and has its place in any comprehensive crime prevention strategy.

However every standardisation bears the risk of standardising mistakes, which are then difficult to change once the standard becomes a routine. The rather crude scoring system that underlies the risk assessment of the standard has the advantage that it is easy to apply and the disadvantage that it may not be as meaningful as the numbers suggest. It appears that social trust and cohesion is the main driver of some of the assumed risk factors (e.g. incivilities). An urban security policy that rests on the assessment of flawed indicators is likely to cure symptoms rather than causes. Moreover, standardised risk assessments are prone to overlook idiosyncrasies in the social configuration of an urban area. It should therefore be applied in combination with other approaches.

The EN(V) 14838 series is a valuable aid for practitioners who would rather choose from a set of standardised measures against crime than try to invent new ones. Surprisingly the standard is hardly known among practitioners. According to a (not representative) survey of the German Institute on Urbanism Affairs (Difu 2012: 23) less than one out of ten polled city planning offices knew about this standard.

It should be noted that the European Standard on Prevention of Crime is not the only standardised tool for enhancing urban security. In fact there are more compendiums, reports, manuals, guides and handbooks available than this report can cover. Table 5 lists some of the available resources that are similar to the EN 14383 series. Unparalleled in detail and complexity is the risk assessment guide to the mitigation of terrorist attacks against buildings of the US Federal Emergency Management Agency (FEMA 425). The guide is a useful supplement to EN 14383, where measures against political

[5] The most cost effective way to buy the standard is the online shop of the Estonian Centre for Standardisation: http://www.evs.ee/groups/13745/protection-against-crime

violence are only considered in regard to attacks against buildings with vehicles but not in regard to other aggressor tactics such as the use of biological threat agents, IEDs, or small arms (RPGs, guns). The guide includes a standalone software application called the Risk Assessment Database "that is both a collection tool and a management tool. Assessors can use the tool to assist in the systematic collection, storage, and reporting of assessment data. It has functions, folders, and displays to import and display threat matrices, digital photos, cost data, emergency plans, and certain Geographic Information System (GIS) products as part of the record of assessment. Managers can use the application to store, search, and analyse data collected from multiple assessments." (FEMA 2005: B1-3).

Table 5: Selection of resources for guides and tools on crime prevention through urban design (referring partly to German Institute of Urban Affairs 2012: 23)

Institutions	Title
Hessian Ministry of Interior	Recommendation of quality seal "Secure Housing".
Saxony Ministry of Social, Women's and Family Affairs and of Health	Instructions "Secure living quarters - good neighborhood"
North Rhine-Westphalian Crime prevention council	Handbook "Crime prevention through urban design"
State of Rhineland Palatinate	Guide to urban design and crime prevention
State of Saxony	Standards for the "security badge secure Housing"
City of Detmold	Checklist for developing areas in rural regions
Dutch Centre for Crime Prevention and Safety	'Politiekeurmerk veilig wonen' (police quality seal secure housing)
Australian Capital Territory Government	Crime Prevention and urban design resource manual
New Zealand Police	Guidelines for CPTED for licensed and off-licensed premises
US Department of Housing and Urban Development	Creating defensible space
Federal Emergency Management Agency (FEMA)	FEMA 452. Risk Assessment. A how-to guide to mitigate potential terrorist attacks against buildings.

Many of the resources listed in the table are redundant and offer similar tools and practical recommendations. A noteworthy exception to this canon are the "Guidelines for CPTED for licensed and off-licensed premises" (ALAC 2012). This resource can be a meaningful add-on to the European Standard, which deals with different types of urban settings (e.g. schools, petrol stations, shops and offices) but not with the ubiquitously notorious hot spots of bars and night-time entertainment areas. The guide provides checklists with indicators, as well as prominent planning mistakes in the layout, interior and exterior design of bars, clubs, 'watering holes', and alcohol-selling convenience stores.

Finally, the ISAN Prevention Model offers a good trade-off between theoretical and empirical validation on the one hand and practical applicability on the other. Its strength lies in the combination of indicators from four crucial fields of urban security policy: social **I**nfrastructures (e.g. good schools, day care, youth centres); **S**ocial management (e.g. concierge service, neighbourhood management office); **A**rchitecture and urban design, and **N**eighbourly community (e.g. social trust, cohesion).

3.2. Predictive Policing and crime mapping technologies

This section reviews elements from predictive policing and crime-mapping services, relevant to the BESECURE framework. Predictive policing is a neologism and umbrella term for a set of integrated practices and methods which are employed to collect, analyse and respond to data.

This process usually includes geographical information about crime. The geographic representation and analysis of crime is an innovation made some 185 years ago (Weisburd, McEwen 1997:4). As of today, smart cities rely on advanced GIS as a means to improve the living conditions of its inhabitants and to enhance security. Mobile and cloud computing open up new fields of crime analysis and crime mapping that allow users to monitor crime reports in big cities almost in real time. Gunfire locators (ShotSpotter) sense the use of guns and transmit the location to law enforcement agencies. Powerful computers and complex algorithms help to shape Big Data. But what are the actual benefits of this sophistication? To better decide which new technologies are most beneficial for a BESECURE framework this section reviews the functionalities of online crime mapping services and instruments of predictive policing.

For this purpose, it is reasonable to look to the highly advanced Anglo-American crime mapping market, even though many of these examples cannot be transferred one-to-one to the European context for several reasons. Rather than carrying out our own time-consuming research on crime mapping software products, this report draws on the results from the “survey and evaluation of online mapping companies” mandated by the US Department of Justice. It provides “a baseline assessment of what companies exist, what features they provide, data uses, data quality and analytical functions” (Paulsen, LeBeau 2012: 6).

Seven online-mapping crime services are included in the exploration of the online crime mapping market. Table 6 summarises the results of the survey. The most advanced service in terms of functionalities is “Regional Analysis and Information Data Sharing” (RAIDS) provided by BAIR Analytics. The company Public Engines Inc. provides free monthly online training sessions for users in which analytical practices such as intelligence-led policing, and predictive analysis are taught. The accuracy of the data from all seven products was within a small margin of error. The report also raises critical questions about privacy issues of the victims of the mapped crime incidents.

In addition to online services there are numerous standalone desktop/mobile applications for crime mapping available. Given the necessary data, crime mapping can be done using conventional GIS software (such as ArcGIS). Usually these products provide more analytical functions than online services and require more skills and training in GIS. This is where crime mapping companies such as BAIR Analytics and Public Engines come into play: they compile the customer’s data into meaningful maps with functions law officers can use on the strategic and tactical levels. Moreover, the crime

mapping business also includes the organisation of conventions and conferences, as well as training courses. This is not the place for an introduction into crime mapping, but the reader who wants to learn the necessary skills to set up his own crime mapping GIS project will find plenty of useful text-books (e.g. Chainey and Ratcliffe 2005), whitepapers (IACA 2012) and comprehensive training pro-grammes such as those offered on a non-profit basis by the National Institute of Justice (NIJ) and the International Association of Crime Analysts (IACA).

Table 6: Summary of results of "survey and evaluation of Online Crime Mapping Companies" (Paulsen, LeBeau 2012)

Features / Product (Company)	functionalities										Data					fees
	# of agencies served	Crime types	Temporal Analysis	Map display	Non-crime data	User alert	Buffer analysis	Advanced analysis	Mobile App	Other	Acquisition method	Receipt schedule	storage	Storage duration	validation	
Crime Mapping (The Omega Group)	144	All major crimes	Yes, variable	Pin	No	Yes	No	Trend Report	Yes	Detailed reports	Direct connections to agency RMS*	Usually every 12 hours	Secure hosting facility	Rolling 90 days	Tested for accuracy before going life	Fixed monthly based on agency size
Crime Reports (Public Engines Inc.)	1.700	All major crimes	Yes, variable	Pin	No	Yes	No	No	Yes	Provide tips online	Direct feeds or uploads	daily			Multiple methods	Fixed monthly based on agency size
EveryBlock (msnbc*)	16	All major crimes	No	Pin	Yes	No	No	No	Yes	-	Scraping from public websites; consuming public feeds	Daily, hourly, near real time	Secure	Indefinitely	yes	free
Mapnimbus (Geo. Techn. Group)	25	All major crimes	Yes	Pin	Yes	Yes	No	Reports	No	-	Agency upload	daily	Secure hosting facility	In perpetuity	Yes	Based on agency size
My Neighborhood Update (Corona Solution)	26	7 basic crimes	Yes	Pin	No	Yes	No	Trend charts	No	-	Direct connection; automated feed	Up to every minute	Off-site secure facility	1 year	Automated data check	Free. Updates are priced based on agency size
RAIDS* Online (Bair Analytics)	100+	All major crimes	Yes, variable	Mult.	No	Yes	Yes	Density trends	No	Multiple advanced tools	Agency upload	Depends on agency	Secure hosting facility	Based on agency preference	Thoroughly tested	Free. Monthly fee for law-enforcement-only tool ATACRAIDS*
Spotcrime (Spot Crime)	n.a.	8 major crimes	No	Pin	No	Yes	No	No	Yes	Report a crime	Scraping from public websites; consuming public feeds	n.a.	n.a.	n.a.	n.a.	n.a.

* Abbreviations:
RAIDS = Regional Analysis and Information Data Sharing; MSNBC = Microsoft National Broadcasting Company; ATAC = Automated Tactical Analysis of Crime; RMS = Remote Management Station

The spatial analysis of crime patterns can include the prediction of crime, which is often referred to as predictive policing. Probably the most prominent example of a predictive crime mapping tool on the market is the software 'predpol'. Time, Al-Jazeera, The New York Times, The Economist, BBC, and legions of bloggers have reported about this product. For a large part the media wrongly depicted the software as being able to 'forecast crime' (for a really good journalistic 'story' about predpol see Bond-Graham, Winston 2013 in SF Weekly). Fact is that a thorough external evaluation of the instrument is still missing. The company itself claims evidence of a 13 percent decline in crime rates (compared to control sites) four months after the implementation of the system. A longitudinal evaluation without a control site indicated a drop of 19% in property crime in an area where the software was implemented (Heaton 2012). Although the algorithm and the exact methodology of the 'predpol' software is a well-kept secret, it seems safe to say that it combines some of the statistical models mentioned in the next section, such as near repeat modelling, self-exciting point process modelling and kernel density estimation. The vital statistical parts of the predpol engine are described in an article published by predpol developers in the Journal of the American Statistical Association" (Mohler et al. 2011). If not for its capability to actually predict crime, predpol is a paragon for successful marketing that includes PR, political lobbying, and the building of credibility and trust by summoning well known academics, Silicon Valley celebrities, and police professionals from the highest echelons as testimonies for the product (Bond-Graham, Winston 2013).

Predictive policing, if one wants to use this term, includes not only spatial analysis but all instruments – new and old – that have the purpose to assess future crime risks. The next section gives a general overview of these instruments without explaining them in detail. The reader should keep in mind that these instruments should not be mistaken for interventions: from the public discussion it appears that some commentators believe that predictive policing is tantamount to the prevention of crime. Even though crime mapping can govern police action, this represents but one type of crime prevention among many other approaches: criminal justice. The BESECURE approach promotes expanding certain elements from predictive policing beyond classical police work into a comprehensive approach to crime reduction.

Predictive policing

"Researchers, educators, government officials, consultants, crime analysts, police commanders, private software companies, civil rights activists, and the media have all made their interests and positions on the topic well known, and it continues to be hotly debated both inside and outside policing circles. There are a number of stakeholders worth noting in the field of predictive policing. Researchers have the background and expertise to design predictive models; civil rights activists are concerned that these techniques may intrude on the rights of citizens, especially poor and minority populations; analysts and investigators have a professional interest in how these approaches can improve their work and make it more useful; police chiefs are eager to find new techniques to reduce crime without adding to their workforce; and the private sector sees potential funding from research grants, consulting, and software development." (RAND 2013: 5).

Conventional and advanced analytical tools

Recalling the nine sectors of crime prevention described earlier in Section 2.1 of this report, it is now time to focus more narrowly on the corresponding methods and data requirements for each of these sectors. Table 7 represent the tasks, approaches and statistical models that are associated with each of the three possible targets of crime prevention: the offender, the situation/location, and the victim. Whether conventional analytics or more advanced (predictive) analytics are employed depends on the volume and complexity of the data, which in turn is usually determined by the size of the city / jurisdiction of the department. Traditional and intuitive police work may be the most effective approach to enhance security in small and medium sized towns, whereas more complex crime environments usually require more systematic approaches.

The overview in Table 7 sets apart different fields in which predictive instruments can be applied. On the offender level there are tools to assess the risk of recidivism, domestic violence, amok and school shootings, retaliatory violence of gangs, and market activity of organised crime. On the situation/location level there are two types of tools, the first used to identify areas at increased risk and the second to identify risk factors in urban settings. The objectives of instruments working on the victim level are: to identify vulnerable populations, to identify how different characteristics of the urban setting influence the risk of individual victimisation, to identify individuals with a high risk of victimisation (e.g. for domestic violence).

All the instruments summarised in the table produce different kinds of statements as a result. Some result in probabilistic statements, other in descriptive scenarios. This poses a problem for the decision maker because results cannot be compared meaningfully, or it takes a lot of interpretative effort to do so. For example, the statement: “The presence of a licensed premise in an certain area increases the likelihood that a violent crime will take place in the confines of this area by ten percent” is a very different result than the statement “The presence of a licensed premise in an certain area accounts for ten percent of all crime incidents in this area”. How is a decision maker supposed to know which effect is more harmful for his city? Unfortunately the more advanced and more valid statistical models tend to produce rather confusing results such as non-linear coefficients (logistic regression weights) or odds ratios.

Technical sophistication, it seems, is not necessarily an advantage to every analyst and stakeholder. Table 7 therefore discriminates between conventional (heuristic) means to enhance security and more technology driven ones. Both have their place in managing urban security. Interviews with crime analysts conducted in the US and Canada by the RAND Corporation showed that "Instead of using the more mathematically structured hot spot methods, departments often use less sophisticated techniques to uncover actionable crime hot spots. They found that these methods are effective because police departments know their cities. Specifically, they know the high crime neighborhoods, the types of crime likely to occur in each neighborhood, and when they are likely to occur. They know and understand the population and, generally, they can easily discern crime indicators. We asked, 'What predictive techniques do you get the most use out of?' One crime analyst responded by describing what can only be interpreted as purely heuristic tools" (RAND 2013: 27). The best example of such a purely heuristic but nevertheless effective and much favoured tool is the classical crime pin map."

Table 7: Conventional and advanced instruments for the analysis of crime referring to RAND (2013: xv-xvii)

Target of the measure \ task, data, instrument	task	conventional instruments (low to moderate data demand and complexity)	predictive instruments (large data demand, high complexity)	(statistical) models
Offender (also groups)	**Identify individuals who may become offenders:** ▪ Probationers and parolees at greatest risk of reoffending	Clinical instruments that summarise known risk factors	Regression and classification models using the risk factors	Multiple regression models: linear, non-linear, stepwise, splines. Results: probabilistic.
	▪ Domestic violence cases with a high risk of injury or death	Intimate partner violence (IPV) risk assessment scales (Messing 2012)	Intimate partner violence (IPV) risk assessment scales (Messing 2012)	
	▪ Amok and school shootings	Threat assessment (e.g. FBI 1999)		Self-exciting point process (Mohler et.al. 2011), near repeat calculation (Ratcliff 2009)
	Find a high risk of a violent outbreak between criminal groups	Manual review of incoming gang/ criminal intelligence reports	Near-repeat modelling (on recent intergroup violence)	
	Organised crime	Illicit market analysis (Albanese 2008); Risk Assessment (Beken 2004)	Environmental scanning, Delphi Surveys, scenario writing	Qualitative methods, e.g. expert opinions, Delphi method
Situation/ location	**Identify areas at increased risk:**			Grid mapping, covering ellipses, kernel density estimation (KDE)
	▪ Using historical crime data	Crime mapping (hot spot identification)	Advanced hot spot identification models	
	▪ Additional crime data (e.g. police emergency calls)	Basic regression models created in a spreadsheet program	Regression, classification, and clustering models	Multiple regression, leading indicator
	▪ Accounting for increased risk from recent crime	Assumption of increased risk in areas immediately surrounding a recent crime	Near-repeat modeling	elf-exciting point process, near repeat calculation, Pro Map (Shane et al. 2009)
	▪ Determine *when* areas will be most at risk of crime	Graphing/mapping the frequency of crimes in a given area by time/date	Spatiotemporal analysis methods	Heat maps, additive models (ST-GAM), seasonality graphs
	Identifying geographic features that increase the risk of crime	Inferences from known hot spot locations	Risk terrain analysis	Geospatial predictive analysis
victim	**Identify vulnerable populations (crime type specific)**	Crime mapping in combination with population characteristics	Advanced models to identify hot spot and population based risk factors	KDE
	Identify people directly affected by at-risk locations	Basic graphing or mapping of most frequent crime sites people present	Advanced crime-mapping tools to match hot spots with the identify of workers, residents who frequent these locations.	Risk of urban victimisation: CrimeStat duel kernel density routine (Oberwittler, Wiesenhüter 2004)
	Identify people at risk for victimisation	Criminal record review: Multiple victimisation of repeating offenders.	Advanced data mining of crime databases to identify repeat offenders at risk of victimisation	Various models
	Identify people at risk of domestic violence	Review of domestic disturbance incidents	Computer-assisted database queries	
Relevancy for a BESECURE framework		high	medium	low

The results from BESECURE stakeholder interviews in Freiburg came to similar conclusions and reveal that the acceptance of electronic decision-support tools and advanced analytics can vary a great deal between different institutions as well as within different organisational branches of the same institution. Interviews with police officers in the city of Freiburg (230,000 citizens) showed that more advanced managerial tools and information systems are of little value for the police and the munici-

palities. The interviewed experts see the value of such tools on a higher organizational level, such as the Ministry of Internal Affairs. For establishing a BESECURE framework it is important to know more about the critical size of a city in regard to the meaningful implementation of electronic decision making tools. It is also crucial to know more about breaking points of organisational size, that is, at which point the decision making process of an organisation is so complex that electronic support would improve this process. A thorough end user analysis also has to address the question which cities would benefit to what degree by the adoption of electronic planning tools? What kind of cities can be efficiently policed by intuition and experience and which cities need electronic management

Conventional crime pin map used in a department of German municipal Police (Photo: Badische Zeitung Oct/10/2012)

Predpol developer [redacted] demonstrating predictive policing at an LAPD command post in 2012 (Photo: AP/Damian Dovarganes)

Figure 1: Conventional and advanced instruments in policing and hot spot analysis

support in order to enhance urban security efficiently?

The BESECURE approach seeks to strike the right balance between technology driven and conventional (heuristic) means of crime prevention by letting the end user decide upon the tools he wishes to implement. Which method is finally used within the BESECURE framework is the end user's decision. Regarding the exaggerated expectations, the critique, and the worries that some people associate with predictive policing it seems advisable to rethink the usage of the term within European crime prevention practice. Moreover some of the misconceptions should be countered before they spread, such as the "erroneous theme that advanced mathematical and computational power is both necessary and sufficient to reduce crime" (RAND 2013: 115)

Nevertheless, some of the instruments within the large repertoire of predictive approaches to crime prevention have clear benefits. The most relevant instruments for a BESECURE approach are those that target the situation/location of crime incidents. On this level Risk Terrain Modelling (RTM)

*Crime*Stat dual kernel density routine (Oberwittler 2004) can draw quite a different picture of the risk landscape within the urban environment, by, for example, discerning between the spatial distributions of crime events within the city versus the spatial distribution of crime incidents in relation to characteristics of the neighbourhood. For an introduction into the functionalities of the *Crime*Stat programme see Levine 2006 and 2008: 187-193. The *crime*Stat programme (current version IV, released June 2013) is open source.[6]

Risk Terrain Modelling

RAND (2013:51): *"Risk terrain modeling (RTM) is a simple approach to assessing how geospatial factors contribute to crime risk that was developed by Joel Caplan and his associates at Rutgers University. In their compendium on RTM, Caplan and Kennedy describe RTM as follows:*

> *Risk Terrain Modeling (RTM) is an approach to risk assessment in which separate map layers representing the spatial influence and intensity of a crime risk factor is created in a geographic information system (GIS). […] All map layers are combined to produce a composite risk terrain map with values that account for all risk factors at every place throughout the landscape (Rutgers Center on Public Security, 2011).* [http://www.rutgerscps.org/rtm/]

RTM is a toolkit that plugs into ArcGIS. The method used is fairly simple. First, the analyst lays a grid over the jurisdiction to be analyzed. The analyst then tests the statistical relationship between the presence of certain geospatial features in grid cells (where the geospatial features are marked in GIS layers) and the presence of crimes of interest within that grid cell. Features with a strong positive association with crime are selected for the model. The method then counts the number of selected features present in each grid cell; grid cells with the greatest number of risk-inducing features are labeled as likely hot spots (and colored red or orange, typically)."

Muller/IBM (2011): *"Risk terrain modeling provides a way to measure multiple risk factors across spatial units. The resulting product produces a "risk terrain" map which displays the intensity of all risk factors for each spatial unit. This map shows where conditions are favorable for crimes to occur […] The website also provides documented known risk factors by crime type to help identify aggravating and mitigating risk factors. You can decide which risk factors to include through testing with statistical analysis the place-based correlation of each risk factor with the outcome event of interest. An ad hoc approach can also be used, but this requires that you justify your decisions based on existing theory, empirical research and professional experience. At each spatial unit, every risk factor can have only one of two possible values (0 or 1 for aggravating factors, -1 or 0 for mitigating factors). Multiple case studies, and documents on applying RTM to specific crime types (e.g., shootings, aggravated assault) can be found online."*

https://www.ibm.com/developerworks/community/blogs/johnmuller/entry/preview_of_predictive_policing_publication11?lang=en

[6] All programme resources are available at:
http://www.nij.gov/topics/technology/maps/pages/crimestat.aspx

Instruments that assess purely individual risks of offending, recidivism and victimisation (such as clinical and forensic inventories) are of lesser importance from an urban policy point of view, with the exception of those instruments that address the perpetrators and victims of domestic violence. This topic has been mentioned by several stakeholders as a vital concern of their city and considering the immense dark figure of this crime, it is easy to see why.

It is beyond the scope of this report to go into greater technical detail of each instrument for predictive policing, crime mapping and hot spot analysis. For the purpose of this section it suffices to provide a rough overview of the range of available applications, models and processes.

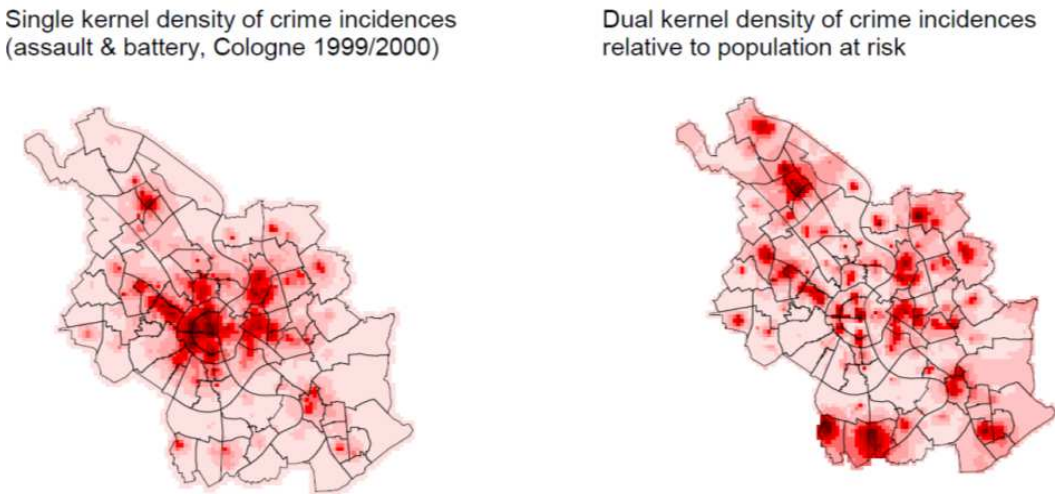

Figure 2: (Oberwittler 2004: 208): Risk surfaces of violent crimes using residential population (left) or population at risk (right) as denominator (Cologne, 1999/2000, dual kernel density estimation in CrimeStat 2.0).

One area of application of these tools that seems underdeveloped is the evaluation of preventive measures. Some of the models could be used to evaluate the effectiveness of policy interventions, that is, to what degree they mitigate crime risk. Especially in cases where a randomised control group design is not feasible to assess the measure, it can be the second best approach to include the intervention as a potential protective factor into a risk assessment model.

3.2.1. Appraisal of predictive policing technologies

The use of computerised aids for the prevention of crime in Europe is a far cry from its Anglo American counterpart. This is neither per se a good nor a bad thing. Many of the benefits of new technologies come together with new risks, such as concerns over privacy issues. There is some indication that predictive crime analysis can improve police performance and thereby enhance urban security. But this success has to be weighed against potential fears among the public about the practice itself. Some people may prefer the worry of street crime over the apprehension that the authorities own a tool that can predict it.

According to a baseline assessment of predictive policing, a common pitfall in the application of predictive policing is "overlooking civil and privacy rights" (RAND 2013: 124). Some technologies mentioned in this chapter could not be implemented in European countries for constitutional reasons. Another important observation taken from the Anglo American experiment is that advanced methods are not necessarily better than the intuition of experienced professionals. Or as one of the BESECURE stakeholders in Freiburg put it during an interview: that the implementation of a decision support tool "would be more trouble than it's worth".

A recent report on predictive policing from the RAND Corporation advises vendors and developers of software tools to "move beyond predictions to offer explicit decision support for resource allocations and other decisions." (2013: xxii) This is what the BESECURE approach is essentially about. In order to advance the already sophisticated field of urban security enhancement it is essential to provide easy-to-use, affordable (if not free), accessible, intuitive but yet beneficial instruments. Moreover we recommend utilising some of the instruments discussed in this section in other areas of crime control and prevention. Therefore the next section moves from this more technical discussion to the area of policy decision-making and the question: what can these tools and instruments do about the problems that have been identified?

3.3. The matrix of evidence-based policing

In this chapter we move from the computer-assisted analysis of crime issues to the analysis of policies and interventions. The nine types of crime prevention presented earlier in this report provide a minimalist overview of different intervention paradigms at the offender-, location-, and victim level. The evidence based policing matrix makes this conceptual idea practicable, leading to a better identification of the best-suited specific course of action. It is an interactive online tool and works as an interface between research and practice. At its back end stands a continuously updated repository currently containing the results of 125 evaluation studies in the field of policing. At the front end all studies are visually arranged in a cuboid that supports helpful GUI functions such as mouse-over hover boxes that show short information about the otherwise only pictorially represented studies. Moreover it is possible to look into specific segments of approaches (e.g. only approaches at the micro place level) and review the respective information in table form.

The objective of the instrument is to process the results of evaluation studies in such a way that they become meaningful information to practitioners, and not just a simple list of (best) practices. How is this done? Studies that qualify as scientific evaluations[7] of crime interventions are alphanumerically tagged (coded) in regard to three attributes of the intervention. At the front end these attributes are

[7] The research design of the evaluation must be experimental or quasi-experimental.

represented by three axes in a cuboid. Each study is located within this cuboid according to the configuration of its attributes.[8] The three attributes are:

(X) *Type or scope of target* (parameters: individuals, groups, micro places, neighbourhoods, jurisdiction, nation state).

(Y) *Specificity* (parameters: general, focused)

(Z) *Proactivity* (parameters: reactive, proactive, highly proactive).

The effectiveness of each intervention in reducing crime (non-significant-, mixed-, significant effect) is represented by the shades of the dot that represents the study within the cuboid. Interventions that were assessed as having a harmful effect are represented by a triangle. A fifth attribute (methodological rigor) becomes visible only when the user clicks a study or reviews a single slice of the cuboid (Figure 3).

[8] The Z and Y axis can be thought of as continuums (with continuous numerical values) but they are treated as ordinal categories with discrete values. The X axis carries both ordinal and categorical information (a group is smaller than nation state but a micro place is neither more or less in value than a group, but a different entity).

The tool is available online[9] together with a key[10] to the symbols, videos of workshops and general background information.

The matrix closely resembles the distinction into primary, secondary and tertiary prevention addressed to offender, location, or the victim as discussed in Section 2.1 (Table 2). 'Highly proactive' is synonymous with primary long-term prevention; reactive is synonymous with tertiary prevention. The matrix adds *specificity* as a reasonable third characteristic thereby discriminating between crime

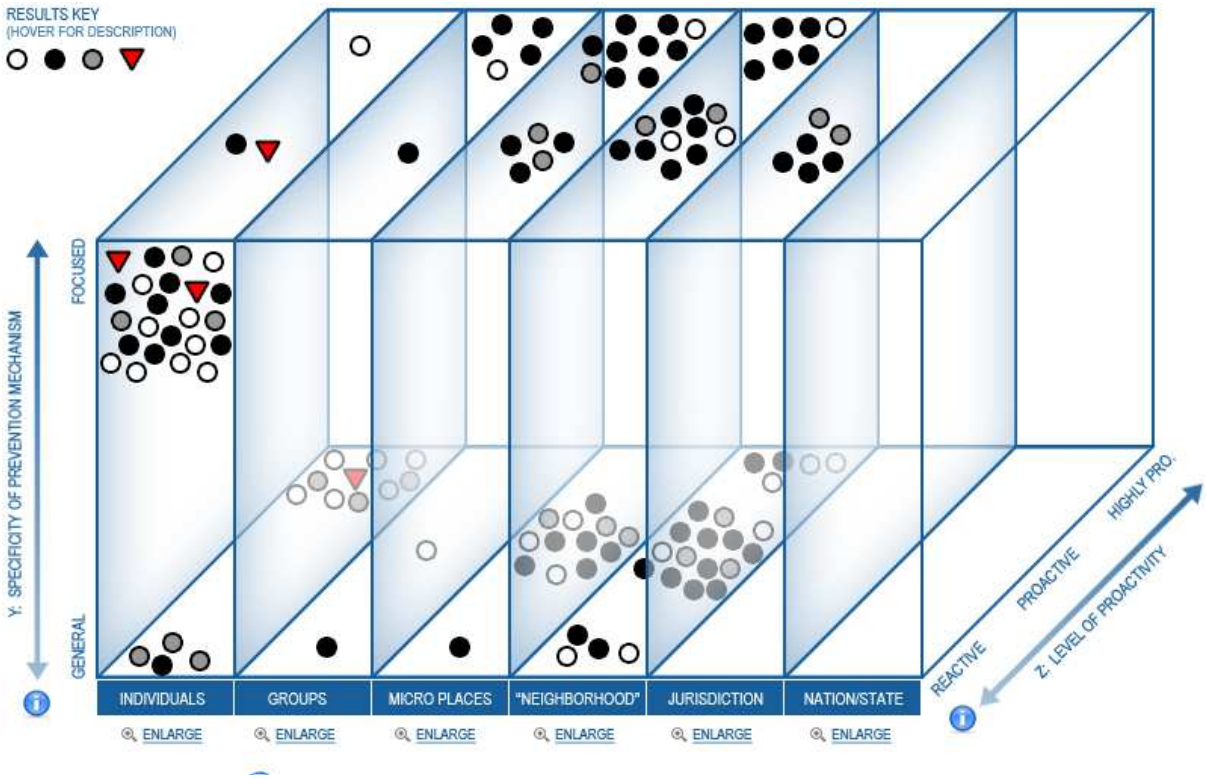

Figure 3: The evidence-based policing matrix (Lum, Koper, Telep 2011).

prevention that is focused on single crime issues (e.g. burglary), and crime prevention that is focused more broadly on for example violent crimes. Specificity can also describe the approach, for example by telling apart the measure "no alcohol in public transport" from the measure "no alcohol in public".

3.3.1. Appraisal of the evidence based policing matrix

The evidence based policing matrix is a literal show case for criminal justice policies. It can contribute a great deal to the management of urban security if it would show not only criminal justice approaches but also civic crime prevention policies. The virtue of the tool is that it can relatively easily

[9] http://cebcp.org/evidence-based-policing/the-matrix/

[10] http://cebcp.org/wp-content/evidence-based-policing/the-matrix/MatrixKey.pdf

be extended and adjusted for this purpose. To use the matrix within the BESECURE project the following changes of the underlying database and coding-scheme are recommended.

- For the BESECURE framework the matrix could be extended in order to include not only policing interventions but also civic crime prevention. To this end additional databases and journals must be considered when searching for evaluation studies to be included in the matrix repository. It is important that the underlying database represents a wide range of approaches and is kept up to date.
- The repository should also include methodologically less rigorous results because some crime interventions defy experimental or quasi experimental evaluation design. It would be a deficit to exclude them entirely from policy decision making for this reason alone. The BESECURE policy platform gives the user leeway to design an urban security approach within organisational, administrative, budget, and political constrains. Scientific evidence may simply not be the most decisive criteria when making decisions that are inherently political in nature. "U.S. police agencies and their international counterparts are well known for *not* using evidence-based practices […]. Many of the causes for this are organizational, related to the stubborn and slow-changing nature of police culture, tradition and practice […]." (Lum, Koper, Telep 2011: 8). This can be considered unfortunate, but unless one believes that this tendency can be changed in the near future, it would be short-sighted to withhold scientifically less rigorous evaluations from policy makers. For this reason studies with different levels of scientific evidence (see Sherman et al. 1998: 5, Farrington et. al. 2002) should be included. Sound qualitative evaluations should be considered, too. Each evaluation result should be displayed to the user together with the information about the research design, using the five levels of the Maryland Scientific Method Scale plus the extra category 'qualitative design'. It is then up to the judgement of the user to decide whether a certain intervention appears to be appropriate within the given context.
- The third recommended modification is to make "crime type" an additional attribute in the coding structure. Again this does not affect the structure of the matrix, but its underlying repository and coding-scheme. With a new category "crime types" it is possible to generate crime-specific matrices that display all the information about the approaches (scope, specificity, proactivity, effectiveness) in regard to a specific issue. The original purpose of the matrix is to reveal clusters of effectiveness in policing practices in general (i.e. to show which particular configurations of scope, specificity, and proactivity are most effective in reducing crime). It could also be useful to identify such clusters for specific crime issues.

Through these three simple modifications the matrix could be used to organise, process and visualise the information of the BESECURE database for the policy support platform and the inspirational platform. Table 3 and 4 in the annex suggests examples how the coding structure can be modified.

What is this tool good for? The matrix is an interface between research and practice. It preselects knowledge that is relevant for urban policy making from a wide range of sources and databases that are otherwise time consuming to research. Given that a sufficient number of relevant studies from a wide range of journals are included, practitioners of different positions and functions can use the matrix to investigate questions such as:

- I am the director of the city's crime prevention council and I want to allocate grants for crime prevention initiatives. Are there certain configurations of approaches that are more successful than others? For example: are proactive and focused interventions at the neighbourhood level more successful in preventing crime, than highly proactive and general interventions at the individual level?
- I am a neighbourhood manager and I want to review approaches on the neighbourhood level only. Which approaches have been implemented and how successful were they?
- The leaders of my organisation want to shift from reactive to more proactive approaches in our jurisdiction. Given the same crime issue, which proactive interventions may replace reactive approaches? Are there crime issues for which reactive approaches cannot be replaced?
- There is a constant increase in burglary in one specific area of the city. What are the most effective reactive interventions? Are reactive measures on the neighbourhood level more effective, equally effective, or less effective to prevent burglary than highly proactive measures on the neighbourhood level?
- The city council wants to see scientific evidence that the interventions of our department are effective. Which are the methodologically most rigorous studies for the evaluation of interventions on the group level? (see Figure 4 and Table 8).

The tool can certainly not give plain answers to loaded policy questions, but it helps the user find a nuanced and substantiated answer quickly. Depending on how much detail is wanted, the tool directs the user to the most relevant evaluations and research articles, which then can be reviewed in all due depth.

Table 8: cross tabulation of SMS [Maryland Scientific Methods Scale] method score versus study results (Lum, Koper,

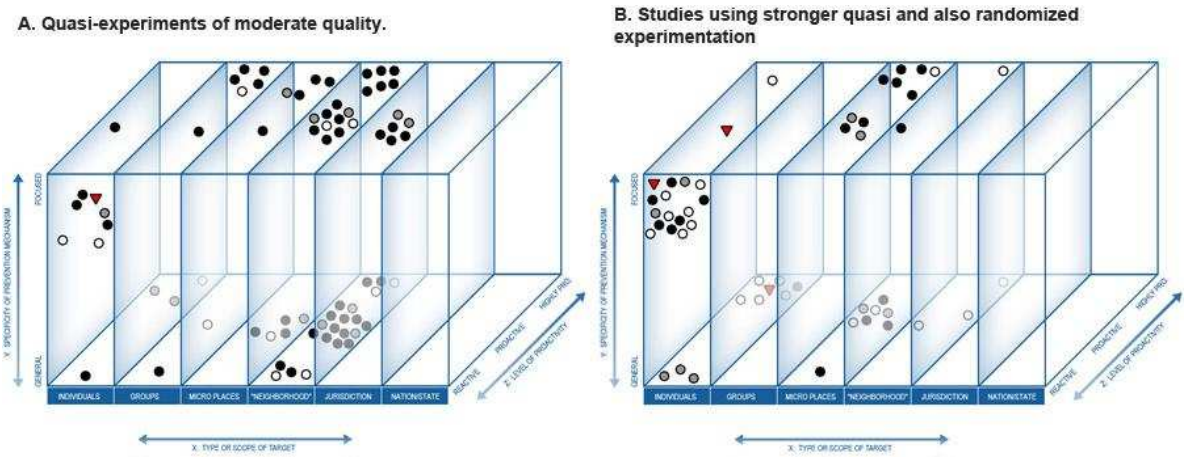

Figure 4: Comparisons of studies in the Matrix of moderate and strong methods. a) Quasi-experiments of moderate quality. b) Studies using stronger quasi and also randomized experimentation (Lum, Koper, Telep 2011: 19)

Telep 2011: 18)

	SMS method score		
	3	4	5
Sig. success	43 (69.4%)	4 (33.3%)	8 (34.8%)
Any other result	19 (30.6%)	8 (66.7%)	15 (65.2%)
Column total	62 (100%)	12 (100%)	23 (100%)

$\chi^2 = 11.213, p = .004$

3.4. Conclusions

The review of research and development in the domain crime prevention in this chapter included:

a) instruments to analyse and monitor crime issues (crime-mapping tools)

b) instruments to analyse crime interventions (the evidence-based policing matrix)

c) instruments that combine both tasks (the European Standard for Urban Crime Prevention).

None of these instruments alone suffices as a comprehensive approach to urban security, but all of them offer helpful elements in order to develop one. Each instrument has potentials, pitfalls and limitations. There is no precise rule of how these instruments can be implemented into the operative process of an organisation. This depends largely on the objectives the organisation pursues, its culture, management, and openness for new developments. There are however general frameworks in which these tools can be imbedded: One such framework is the ISO standard on risk management (ISO 31000). Risk management proceeds in five steps: establishing the context, risk identification, risk analysis, risk evaluation, and risk treatment. At this level it is not so different form the SARA model[11] – the recommended process model of the Center for Problem-Oriented Policing (POP) that proposes the tasks: **S**canning (Identification of the problem), **A**nalysis (learning the problem's causes, scope and effects), **R**esponse (acting to alleviate the problem) and **A**ssessment (determining whether the response worked).[12] These tasks are broken up into 60 steps; each step being a one page policy with a planning directive not exceeding 1,000 words.[13] These steps direct the user to identify the crime problem in all necessary details (e.g. using the environment/behaviour classification scheme of step 15); give structured guidelines how to research and process knowledge about best practises

[11] http://www.popcenter.org/about/?p=sara

[12] http://www.adam-europe.eu/prj/8246/prd/19/4/URBIS_Newsletter_December%202013_EN.pdf

[13] http://www.popcenter.org/learning/60steps/

to this particular crime problem from different sources (step 19); to decide on the most sustainable solution in cooperation with local community partners (step 38), how to evaluate the impact of the intervention (step 46); and how to effectively communicate the whole process including its success/failure to the public, the city council, and other stakeholders (step 54). Taken together the 60 steps provide a comprehensive framework to crime prevention. All instruments that have been discussed in this chapter can also be found in one of the steps of this approach.

Although POP includes and promotes non-criminal justice responses to crime, it remains a "policing" approach. In regard to urban security many cities in Europe approach crime issues not primarily through the police but through civic agencies plus the police. After all the police has a mandate that is not necessarily helpful to solve certain social problems. A civic approach to crime prevention can slightly shift the way problems are identified, analysed and reacted to. In recent years many cities have developed their own security reports and safety indices in order to have a monitoring tool that different agencies can draw upon and relate to. The remaining chapter briefly presents on these security metrics and provides some principle guidelines how develop a simple metric for urban security.

4. Metrics for urban security

This chapter provides a guide to develop a metric for urban security. To this end it briefly describes the Rotterdam and the Amsterdam Safety[i] Index that are examples for such a metric. The purpose of the guide is to demonstrate how available data and indicators can be used to build a crime and security index. It recommends three basic components derived from crime data (section 4.1) urban data (section 4.2) and resident surveys (section 4.3). As a showcase this report sets up a security index for the city of Freiburg.

The Rotterdam safety index (Veiligheidsindex) is a valuable approach to measure urban security through a mix of relevant indicators, including police recorded crime, and survey data about victimization, social cohesion, residential satisfaction and fear of crime. For policy makers, the police and Rotterdam's residents, it became a reasonable source of information for urban safety. The developers claim that "the Safety Index has contributed to the fact that safety has become measurable, both objectively and subjectively, and that we can take action on the basis of this" (Gemeente Rotterdam 2014:43). Other authors have contested these claims (van Swaningen 2007; Noordegraaf 2008) and point to the risk that the index may be corrupted by those policy makers whose performance is measured through the instrument. Notwithstanding these debates, security metrics are popular and various cities in Europe have developed such instruments.

Since 2003, the municipality of Rotterdam publishes the safety index annually. It was planned and developed by the Social Democratic Party in the electoral term 1998-2002. Pim Fortuyn continued this approach because it was well suited for his Law and Order policy. Essentially, the safety index is a score that represents the level of urban security in each of Rotterdam's 75 boroughs. How is this score calculated? Several indicators underlie the index score. These indicators are aggregated and weighted in different stages. The final score is calculated from 12 weighted safety elements. There are four contextual safety elements (social cohesion, edifice, economic prosperity, resident's satisfaction) and eight direct safety elements such as vandalism and violence. All safety elements are weighted by factors between 1.0 and 2.0 according to their assumed impact on security (e.g. vandalism has a weight of 1,0; violence is weighted with 2.0 because its impact on security is more severe). Each safety element, in turn, is calculated from three scores: one objective and two subjective scores. The objective score is based on official statistics of Rotterdam. The objective component of the safety element 'theft' for example is composed of several different crime types that are subsumed as theft in the police statistic. The subjective component of the safety element 'theft' is determined through a public survey of about 10,000 respondents in Rotterdam. Respondents are asked whether they have been a victim of theft (victimisation) and whether they perceive theft as a problem or threat within their borough (fear of crime). Eventually the information about all three scores is pooled into one single score that represents the level of security in each borough of Rotterdam.[14] Because the Rotterdam safety index is surveyed every year it monitors developments over time. The

[14] for more details about the methodology see:
http://www.rotterdam.nl/Clusters/BSD/Directie%20Veiligheid/Document%202014/methodologische%20verantwoording%20VI%202014.pdf

municipality of Rotterdam also uses the index as a performance indicator to evaluate the effectiveness of its urban safety policy.

The city of Amsterdam maintains a similar index (Amsterdamse Veiligheidsindex). It provides an interactive online tool with which users can browse customised crime maps for different crime types (such as violence, theft, burglary) and crime problems as perceived in the population of city districts and quarters. Like the Rotterdam Index it includes longitudinal data from 2003 until 2010.[15] Both indices include elements that are also useful for the BESECURE security metric. The remainder of this chapter will briefly review the three main data components of the Amsterdam and Rotterdam Safety indices: police registered crime data, urban data, and survey data. The showcase to this chapter in the amendment of this report will demonstrate in more detail and with actual data how a crime and security metric can be set up.

4.1. Crime Data

The most important single crime figure is arguably the crimes per capita ratio (usually reported as crime incidents per 100,000 inhabitants). A simple criminological rule of thumb is: the bigger the city, the more crime per capita it will produce (Nolan 2004, Glaeser 1999, Chamlin/Cochran 2004). Victimology teaches that the individual probability of falling victim to crime differs between cities according to population size, and within cities according to neighbourhood characteristics. Statistics of police-registered crime show a clear pattern: the crime rate increases disproportionally with the size of the city. In Germany the crime rate of robbery (measured as offences per 100,000 inhabitants) is 7.6 times higher in large cities (population of more than 500,000) than in small cities (population of less than 20,000). The rate for assaults and minor bodily harm in large cities is 2.5 times higher than in small cities. For insults and damage to property the factor is roughly 2, for theft under aggravating circumstances 3.6, for theft without aggravating circumstances 3.9.[16] Although only 16.2 percent of the German population lives in cities with a population of more than 500,000 this share of the population produces 28 percent of all police registered crimes, whereas the share of the population living in small cities with less than 20,000 inhabitants (41.4 percent) accounts for only 23.8 percent of all crimes (Frevel 2013: 357).

However, from the relation between city size and crime rate one cannot assume that urban growth over time is necessarily accompanied by a disproportionate growth of crime. In fact it is barely possible to make general statements about the longitudinal development of a city's crime rate as a con-

[15] http://osamsterdam.com/index.mpl

[16] Numbers have been calculated from the police crime statistics for Germany in 2011 (BKA 2012:60, see also Frevel 2013: 357).

sequence of population growth (or shrinkage). Too many factors on too many different levels influence the overall crime rate of a city.[17]

On the city level police-registered crime is usually public data. That does not necessarily mean that it is easy to interpret and ready to use. Depending on the national statistical reporting systems, crime data is prone to misconception and flawed interpretation. Often it is hardly possible to draw a crime graph without making several footnotes explaining restrictions, limitations and qualifiers of the numbers. Crime data can be accounted as prevalence (the percentage of convicted and/or suspected offenders in the population)[18] or incidents (the frequency of reported crime incidents (e.g. per capita or per 100.000 citizens)). Note that police recorded crime refers to reported and suspected incidents of criminal behaviour, that is before a case is cleared and processed through the criminal justice system. There are additional statistical systems for each stage of the criminal justice system (cases investigated, offenses cleared, abatement of action, criminal charges, and convicted offenders). These numbers diverge greatly from each other. To give an example: In 2004 there 5.5 million incidents of police recorded crimes in Germany whereas in the same year there were only 0.6 million convicted offenders (BMI 2006: 10).

Although a good deal of interpretation and expert knowledge may be necessary to make proper use of police recorded crime data, it is an indispensable component to a security metric. An urban security metric should show which type of crime is prevalent in which area of the city. More detailed crime data however is usually less accessible. Some cities publish this information, others do not. To develop an urban security metric it is important to know on which geographical unit crime data can be projected. All other indicators (urban data and survey data) of the metric must be available for the same administrative unit (e.g. borough, ward, or district). Otherwise the information cannot be put together in meaningful way.

4.2. Urban data

Socio-spatial indicators provide contextual information about the area. There is no general rule which indicators are relevant, because this depends on the type of crime under investigation. Crime covaries with many different factors (see handbook of crime correlates Ellis et al. 2009). These factors can include risk factors, protective factors, and symptoms of crime.

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[17] Chamlin and Cochran (2004: 119) conclude in their multivariate analysis of the population size-crime relationship: “while population size has no appreciable effect on violent and property crime rates, it is by far and away the single best predictor of violent and property crime counts”.

[18] In the German statistical reporting system of the police this figure is called *Tatverdächtigenbelastungszahl* (TVBZ). TVBZ can be calculated for specific groups (e.g. age cohorts) to compare the proportion of suspects between different groups of the population. For a very comprehensible explanation of the of the idiosyncrasies of the German criminal law statistics, see the Second Periodical Report on Crime and Criminal Control in Germany (BMI 2006).

Van Steden et al. (2013) found a pragmatic way to reduce the overwhelming number of criminogenic factors to a list of 19 socio-spatial indicators (See Figure 5).

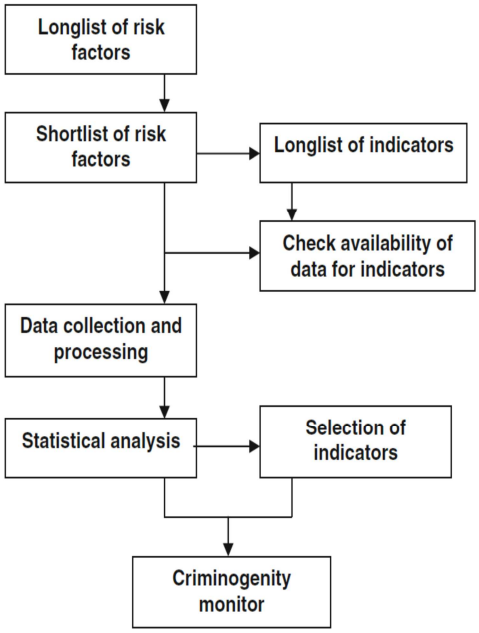

Figure 5: Risk factor selection procedure (van Steden et. al. 2013:50)

These indicators (risk factors) are defined "by their ability to signal the possible occurrence of crime and criminals in certain urban areas, such as neighborhoods and boroughs" (Van Steden 2013: 49). From a list of 127 risk factors identified in criminological literature, they selected those that are most relevant to determine the Amsterdam municipalities Safety Index Score (Amsterdam Veiligheids-index) (see Table 9). Although data for these indicators may not be available in every city, this selection gives a good idea for how and where to start when developing a security metric.

The selection of indicators further depends on the purpose of the analysis. For instance a policy maker who wants to address the question "What are the spatial commonalities of crime hot spots?" needs other indicators than someone who addresses the question: "How does the unemployment rate affect the crime rate of a certain neighbourhood", or "which borough has the highest overall crime risk?"

Table 9: Selected risk factors and indicators (van Steden et. al. 2013:52)

1. Male (per 1,000 inhabitants)
2. Poor competencies (adolescents aged 17 to 22 who left school without a diploma per 1,000 inhabitants in the same age category)
3. Non-western foreigners (per 1,000 inhabitants)
4. Possession of fire-arms (registered suspects in police databases per 1,000 inhabitants)
5. Possession of knifes and other close-combat weapons (registered suspects in police databases per 1,000 inhabitants)
6. Drug addicts (number of opiate addicts per 1,000 inhabitants as estimated by the Municipal Health Service)
7. Adolescents and young adults (adolescents aged 12 to 24 per 1,000 inhabitants)
8. Underage offenders (registered offenders aged 12 to 18 in police databases per postal code)
9. Lack of commitment to school (registered truants aged 5 to 17 per 1,000 inhabitants in the same age category)
10. School drop-outs (children aged 5 to 18 who are not enrolled in any school per 1,000 inhabitants in the same age category)
11. Single parenthood (children in single parent families per 1,000 inhabitants)
12. Divorces (children involved a parental divorce per 1,000 inhabitants)
13. Poorly educated parents (number of poorly educated families per 1,000 inhabitants)
14. Unemployment (job seekers registered at the Centre for Work and Income per 1,000 inhabitants)
15. Poverty (persons living in minimum-income households per 1,000 inhabitants)
16. Crowded housing (housing that provides less than one room per occupant per 1,000 inhabitants)
17. Physical degradation of public space (municipal survey data of respondents' complaints about litter in their neighbourhood)
18. Availability of soft drugs (presence or absence of a coffee shop in a neighbourhood)
19. Inadequate social cohesion (residential turnover as a percentage of registered inhabitants in a neighbourhood)

The kind of analysis that can be performed also depends on the level of the data. With data on the individual level more statistical models can be performed than with aggregated data. In this regard it is also important to point at ecological fallacy which can appear when dealing with data on the aggregate level. To give an example: We observe a positive correlation on the aggregate level such as: "Neighbourhoods with a high percentage of immigrants have higher crime rate than neighbourhoods with lower percentage of immigrants". An ecological fallacy can occur when we infer from this observation that foreigners commit more crimes. This may or may not be the case. With data on the aggregate level this question cannot be answered. It would therefore be premature to launch an integration programme or a group specific crime prevention programme for immigrants based on this kind of analysis.

Next to crime data and urban data, survey data can bring in valuable information to a metric for urban security.

4.3. Survey data

Self-reported crime and victimisation surveys are able to register crime incidents that have not been reported to the police. Moreover, survey data is necessary when concepts such as fear of crime or collective efficacy are part of the index and the subsequent policy intervention.

Collective efficacy describes the potential of a neighbourhood community to achieve collective goals and to perform informal social control. As such collective efficacy cannot be measured in the same way that one can measure the unemployment rate or the average age in a neighbourhood. There are however validated survey instruments that measure social cohesion and social trust within a community, both are elements of collective efficacy. Social cohesion and social trust within a neighbourhood are important dimensions of urban security and therefore are reasonable components of a crime and security index.

The potential of collective efficacy to reduce violent crime in urban neighbourhoods was first tested and articulated in an article by Sampson et al. published in Science (Sampson et al. 1997). The concept describes and measures the degree of social cohesion, and the readiness of a community to perform informal social control in the neighbourhood. Collective efficacy (as the 'collective' suggests) exists within spatially bounded social communities.

In their seminal study Sampson and Raudenbush, scrutinised the already well-established correlation between high rates of violence and neighbourhood characteristics, such as poverty, asking: "what is it, for example, about the concentration of poverty that accounts for its association with rates of violence?" (1997: 918). In short, the study found empirical evidence that "collective efficacy of residents is a critical means by which urban neighbourhoods inhibit the occurrence of personal violence, without regard to the demographic composition of the population".

This result illustrates the pitfalls of using indicators on the level of social aggregates, which can lead to wrong interpretations and thus to flawed policy intervention. From the observation that poor neighbourhoods produce high crime rates (aggregate level) cannot be concluded that poverty reduction is the only means to reduce crime. If poor and disadvantaged neighbourhoods exercise social control and maintain social cohesion, they will produce less crime than poor neighbourhoods with lower collective efficacy. Increasing collective efficacy is usually a more attainable goal than reducing poverty and therefore might be considered a viable strategic option. "Recognising that collective efficacy matters does not imply that inequalities at the neighborhood level can be neglected" (Sampson et al. 1997: 923). So what ingredients are needed to include the concept of collective efficacy into the BESECURE metric?

As said, the degree of collective efficacy in a neighbourhood can be measured through survey instruments. It is crucial that the survey is representative not only for the overall city, but also for every single administrative geographical unit. This may require large sample sizes and sophisticated sampling techniques. The public survey (telephone interviews) for the Rotterdam safety index has a

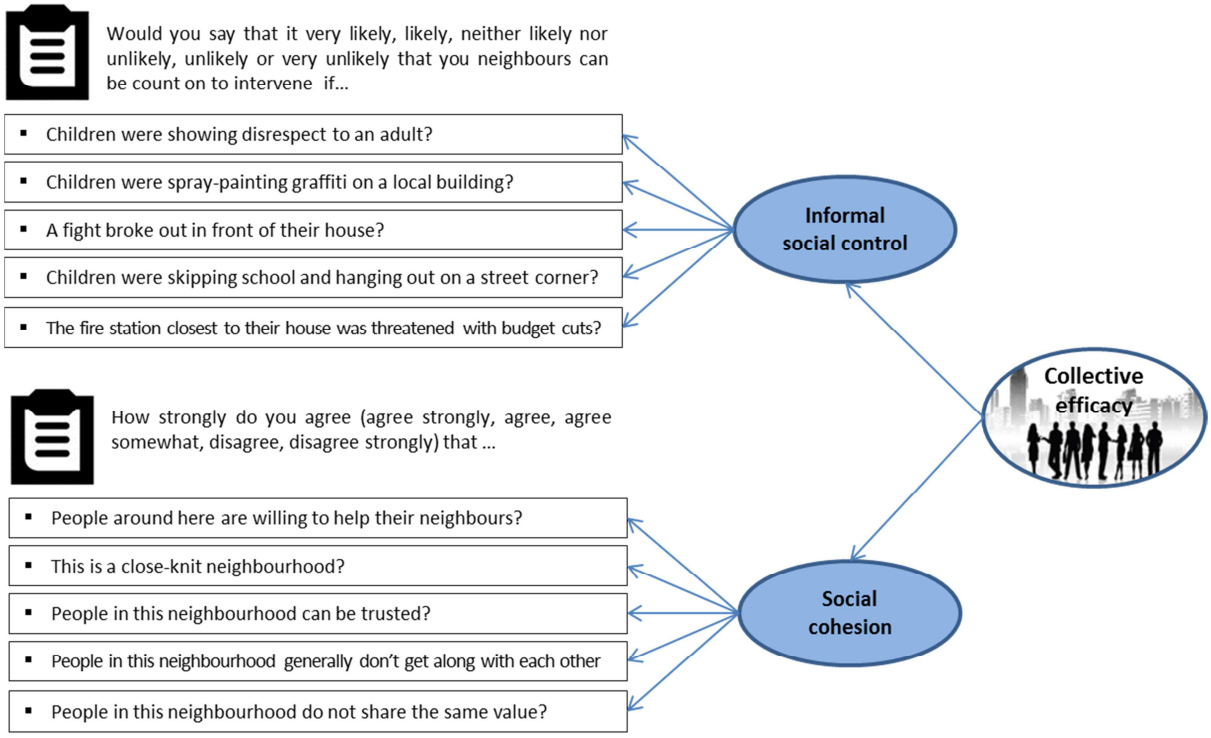

Figure 6: Survey scale to measure collective efficacy as proposed by Sampson et al. (1997)

net sample size of 10,250 respondents (about 150 residents from each borough). The city of Freiburg surveys about 3,000 respondents (postal questionnaire) to obtain a representative sample for each of its 40 boroughs. This survey can include additional scales to measure the level of fear of crime (for survey instruments see Gray, Jackson, Farrall 2012), victimisation and other relevant information.

To measure collective efficacy Sampson and Raudenbush propose a two-component scale with 10 survey items. Social cohesion and informal social control are treated as latent scales of the measurement construct. The individual scores of the items can be summarised in a single variable (e.g. sum score or scaled) which is then aggregated to a geographical unit.

If collective efficacy inhibits crime by countering otherwise criminogenic factors such as poverty, the straightforward question is: what can be done to increase collective efficacy? Surprisingly there are not many known policy interventions with explicit reference to this concept. A recent article in the journal, *Cities,* observed: "While showing a strong negative link between collective efficacy and crime, Sampson and Raudenbush (1999, 2001) never articulated strategies to bring it about" (Rukus and Warner 2013: 37). To fill this void the authors propose "how cities can build collective efficacy, by engaging in facilitative planning to address the needs of families and children" (37). Cancino

(2005) discusses "the utility of social capital and collective efficacy: social control policy in nonmetropolitan areas".

Collective efficacy has been proposed as an "agent of resilience" against chronic violence. The Center for International Studies of the Massachusetts Institute of Technology has developed "a toolkit for urban resilience in situations of chronic violence" (MIT 2012: 11, full report Davis 2012). This toolkit[19] applies to fragile or even *failed cities* that suffer from episodes of severe political violence or violence linked to organised crime.

In addition to deliberate planning many neighbourhood organisations create social cohesion and promote informal social control without explicitly linking their practice to these concepts. If located in the evidence based policing matrix discussed above, measures to increase collective efficacy are proactive interventions on the neighbourhood level that focus on violent crime. As can be seen in the evidence based policing matrix (Figure 4) many interventions within this cluster have been evaluated with a positive result.

Fear of crime in victimisation studies is also a valuable component of a crime and security index. Research into fear of crime came up with many different propositions how to measure the various dimensions of *anxieties* (Lotz 1979), *fear* (Gray, Jackson, Farrall 2012), *worries* (Jackson 2005: 303), *anger* (Farall 2004; Ditton et al. 1999), or otherwise *aversive emotions* towards crime (Armborst 2014).

[19] http://web.mit.edu/cis/urban_resilience_toolkit.pdf

5. Conclusions

This report has demonstrated that many tools used within the police sector can be extended to civic crime prevention. Some of them may be valuable components of the BESECURE tools. Some of the instrument presented in the chapters on crime-mapping services and predictive policing can be used to develop the urban data platform. Users could be given different analytical functions such as risk terrain modelling.

The evidence-based policing matrix is an online tool that links research to practice. It provides a possible structure for the policy support platform and the inspirational platform. It is comprehensible, easy to develop, and presumably helpful for the user.

Urban security metrics such as the Rotterdam safety index are valuable analytical tools. Chapter 4 demonstrates that crime data, urban data, and survey data are crucial components of a security index. The next section (amendment to this report) demonstrates with actual data and in more detail how a security metric can be set up.

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Annex 1: Auxiliary figures and tables

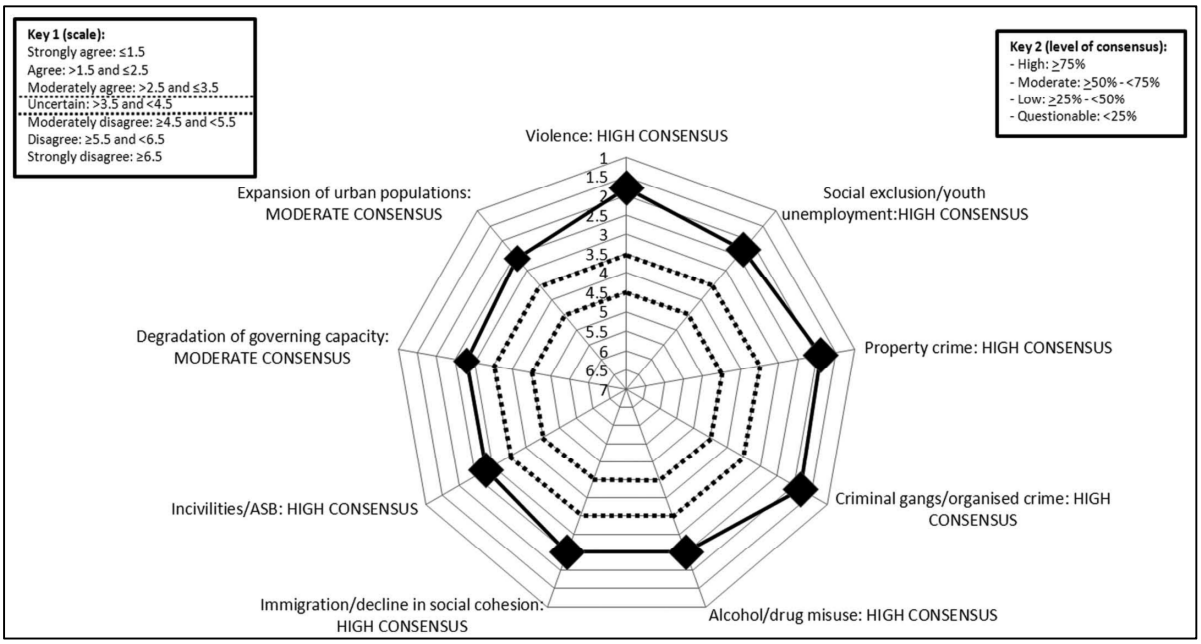

Figure 7: risk management as principle approach for different problems (Edwards, Hughes, Lord 2013: 278)

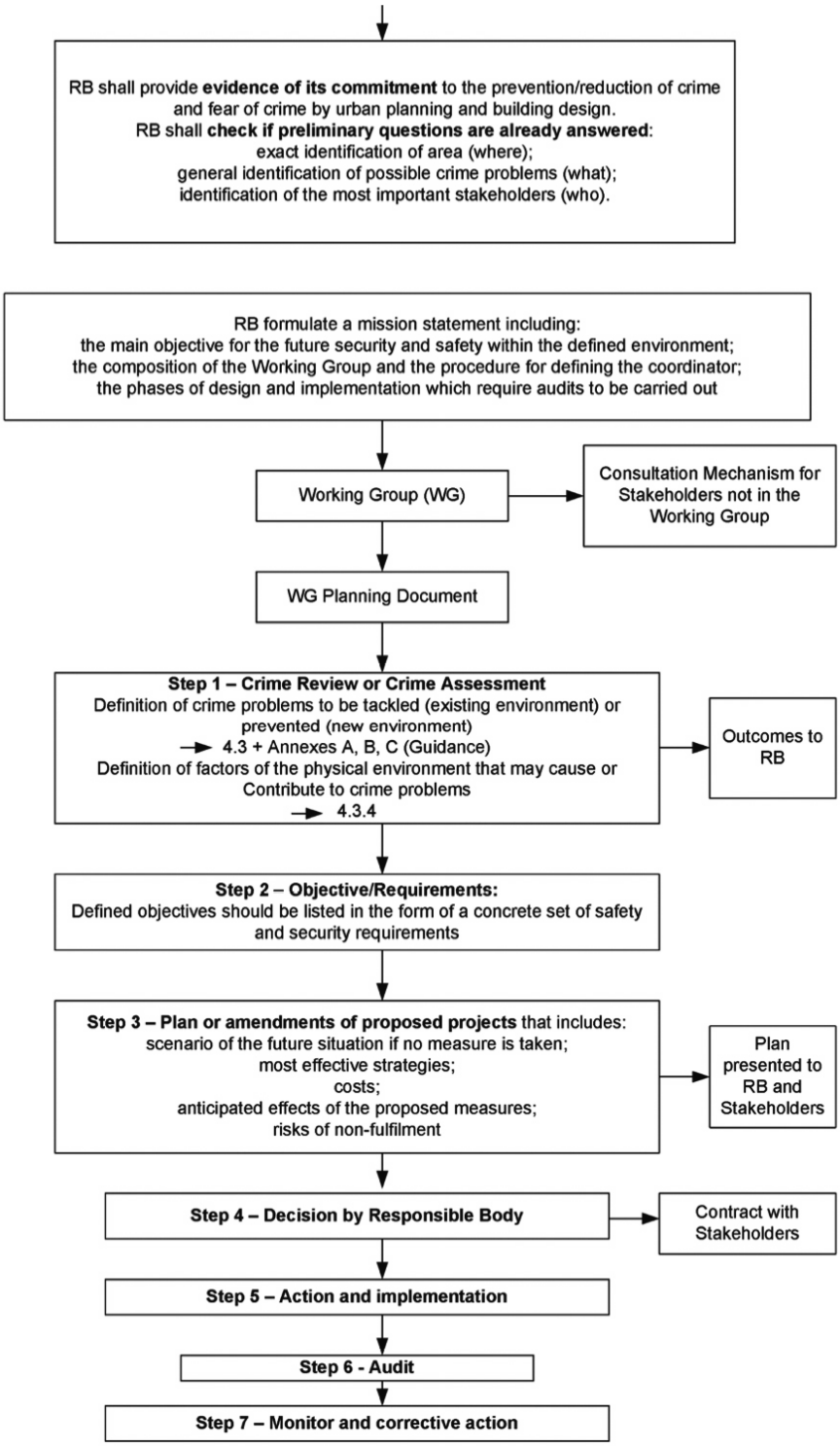

Figure 8: The process of the European Standard on Crime prevention EN 14383 (prCEN/TR 14383-2 2006: 510)

Table 10: Levels at which action can be taken to improve security in the built environment (prCEN/TR 14383-2 2006: 495-497)

			Level of intervention	Example of actions	The key players
Building design (CEN/TS 14383-3: Dwellings and 4: Offices and shops)	Buildings	1	Improving routine security precautions - but no physical change	Change routine activity, management procedures, patterns of use/occupancy; Security staffing	Occupants, management, security staff.
		2	Upgrading security equipment	Security equipment including: locking systems, alarms, cctv, lighting, access control, sensors	Management security staff; Security suppliers/consultants, locksmiths, builders
		3	Refurbishment and alterations to a building	Remodelling of interiors and minor extensions, replacing windows and doors, fencing and gates, etc.	Owners/occupants, facilities managers, developers, architects, engineers, builders
		4	Designing a new building	The design of the building and its relationship to its surroundings	Owners/futures occupants, developers, architects, builders
Urban planning (this prCEN/TR 14383-2)	Public Spaces	5	Improving routine security and no physical change	Patrolling, routes and schedules Cooperation of police and shop owners for surveillance; Improving maintenance; Special measures for construction yards	Police, shop keepers
		6	Upgrading security equipment	CCTV, Private and public street lighting; Lockings; Alarms	Police, owners, public service managers
		7	Refurbishment and upgrading details	Tree maintenance; Street furniture and fences and levels; Street and private lighting; Activity schedules	Local pressure groups, architects, police, maintenance dpt.; Service managers
		8	Re-design of layout	Continuity of pedestrian routes; Activity location and schedules; Shape and use of ground floor; Definition of public and private space; Show traffic flows	Municipality, local pressure groups, architects, police, maintenance dpt., service managers, traffic dpt., public space dpt
Urban planning (this prCEN/TR 14383-2)	Neighbourhood and other urban sectors	9	Improving routine security and no physical change	Cooperation of police and local representatives for surveillance; Neighbourhood watch and patrolling; Community police; Special measures for construction yards	Police, local representatives (residents, shops etc)
		10	Upgrading security measures and equipment	Home safety measures; Street, parks and private lighting; Concierge and videophones; Centralise CCTV, alarms etc.	Police, local representatives, public service managers, private security
		11	Environmental improvement in terms of safety	Promoting activities on the street; Scheduling of activities; Parking lot design; Shape, fencing and layout of parks; Gradual/incremental redevelopment; Management and maintenance of public spaces	District Council, local pressure groups; police, architects and planners, traffic dpt., public transport authority, public service manager
		12	Designing a new development	Guarantee vision of public spaces from buildings; Promote identification of inhabitants with the area; Clear definition of private/public space; Activities at ground level; Concierge; Continuity of pedestrian routes; Location and design of parking lots; avoid underground parking; consider management and maintenance in the design phase	Municipality, District Council, local pressure groups police, architects and planners, traffic department., public transport authority, public service managers
Urban planning (this prCEN/TR 14383-2)	Land use and infrastructure	13	Upgrading existing urban structure	Promote mixed use; Safeguard continuity of urban grid; Respect character of places; Avoid dead/empty areas;Secure parking lots; Schedules of activities	Municipality, District Council, local pressure groups police, architects and planners, traffic dpt., public transport authority public service managers
		14	Upgrading existing infrastructure	Improve public transport routes and stops; limit traffic speed and volumes; location and layout of parking lots	Municipality, District Council, local pressure groups police, architects and planners, traffic dpt., public transport authority public service managers
		15	Planning new developments	Control building density; Introduce mixed use; Continuity of urban texture, built form and building types; Provide continuity of street pattern, pedestrian and bicycles routes, Control shape and location of parks and schools; Develop ground floor activities	Municipality, District Council, local pressure groups police, architects and planners, traffic dpt., public transport authority public service managers real estate developers
		16	Planning new infrastructure	Avoid barriers and enclaves; Guarantee accessibility; Maintain continuity of pedestrian movements; Create capillary public transport system	Municipality, District Council, local pressure groups police, architects and planners, traffic dpt., public transport authority, public service managers

Annex 2: Safety audit framework of an urban security project

Safety audit framework of an urban project (prCEN/TR 14383-2 2006: 520-525)

D.1 The basic principles

D.1.1 **Strengthening the user's identification with the place** and the user's sense of belonging to the place enhances perception of safety and prevention of crime because people develop a sense of respect and protection for the places they belong to.

D.1.2 **Vitality of streets and public areas** is a major factor for crime prevention, because the use of public spaces produces spontaneous surveillance. Mixed uses (commercial, residential, recreation etc.) and diversified activities imply different users at different times, thus providing constant spontaneous surveillance.

D.1.3 **Every measure concerning safety** should take into account the most vulnerable population.

D.1.4 **Urban developments based on creating safer areas** opposed to the outer world (perceived as a source of insecurity) are to be avoided because they will lead to exclusion and residential enclosure or inward oriented spaces.

D.1.5 **Places mainly used by temporary users (stations, interchange points, etc.)** are generally more vulnerable to crime than other areas, due to the scarce sense of belonging to the place of the users. These places should be carefully considered.

D.1.6 **To improve crime prevention**, planning and design should avoid creating deserted spaces (without vitality), as well as undefined or hidden places, because vandalism and other criminal acts tend to concentrate in these places. If un-avoidable, these places should be managed in term of safety.

D.1.7 **A continuous urban grid** and a clear layout of public places improve users' self-orientation and their feeling safe. Visibility of pedestrian spaces and routes from surrounding buildings and streets improves crime prevention and the perception of safety.

D.1.8 **A clear delimitation between public and private space** facilitate the management of the spaces.

D.1.9 **Planning and design of circulation routes to services and housing** should carefully consider safety and accessibility for all kinds of population. If a circulation route cannot provide the sufficient safety or feeling of safety an alternative route should be offered.

D.1.10 **Decayed or abandoned buildings and areas**, as well as dreary places communicate fear of crime and attract antisocial behaviours and crimes. Maintenance and other actions should be undertaken to prevent decay; once decay has started, these areas should be carefully monitored and treated.

D.1.11 **In some cases, to improve crime prevention** it is necessary to support spontaneous surveillance (mixed uses, vitality etc.) also with organized surveillance, implementable in many different ways The organisation of spaces should be conceived in order to facilitate this type of surveillance and emergency intervention.

D.1.12 **Electronic surveillance** (CCTV etc.) **is not an answer** to bad planning or urban design. It is useful only when it is a part of a general security plan.

D.1.13 **Temporary arrangements and situations** (construction yards, detours, temporary barriers and fences) produce not only discomfort but also create potentially dangerous places. Therefore, during construction works next to used spaces, temporary situations and fencing must be carefully studied and designed also in terms of crime prevention.

D.2 Urban planning strategies

D.2.1 Taking into account the existing social and physical structures

a) Does the project function as an integrated part of the whole urban structure?
b) Does the project take into account the needs and demands of the local population?
c) Does the project take into account the existing social networks?
d) Does it encourage local sociability?
e) Does the new built form integrate well with its surroundings?

f) Does the project fit in with the organization of the existing neighbourhoods?
g) Will the project affect the social balance?
h) What measures are taken to manage the impact of changes?
i) Is the new area connected to the existing city structure or does it break the existing pattern?
j) Do the edges of the project take into account the character of the existing urban fabric or do they create a gap in the vitality of the urban system?
k) Does the project take into account the existing crime problems of the area and its surroundings?

D.2.2 Guaranteeing accessibility and avoiding enclaves

a) Does the street network of the project provide continuity with the existing street pattern?
b) Does the project encourage outward-facing layouts and necessary through routes to ensure populated public spaces?
c) Does the building or street pattern avoid creating enclaves?
d) Does the project provide good accessibility to the public transport system and safe routes to the stops?
e) Does the project allow for some traffic flow on local streets so as to avoid creating deserted places or restricted street access?

D.2.3 Creating vitality (blending functions and attractive layout)

a) Do the project functions encourage vitality in the area particularly in public spaces?
b) Does the project foresee mixed uses that generate vitality and natural surveillance?
c) Are pedestrian, bike or mixed traffic routes conceived as to increase vitality and prevent separate movements (that decrease it)?
d) Does the foreseen mix of uses induce compatible activities or will it generate risk of conflicts (i.e. housing and night activities)?
e) Does liveliness go through all-day-long or is it limited to particular times?
f) Do specific areas need all-day-long activities to reduce crime opportunities?.

D.2.4 Providing mixed status (blending socio-economic groups, avoiding isolation and segregation)

a) Does the project encourage a careful mix of social economic groups to reduce isolated and segregated enclaves which increase crime?
b) Does the development participate to balancing social economic groups on the scale of the surrounding neighbourhood or the city?
c) Does the project avoid creating conditions which may induce segregated low income areas?

D.2.5 Creating adequate urban density to allow vitality and natural surveillance

a) Does planning provide opportunities for enhancing the sense of neighbourhood and of belonging to the place?
b) Is land use intensive enough to create opportunities for human presence and liveliness?
c) Do the high-density areas provide for adequate public space?

D.2.6 Avoiding physical barriers (due to infrastructures etc.) and waste land

a) Do the infrastructures of the project avoid creating physical barriers, enclaves or waste land?
b) Does the project overcome physical barriers due to existing infrastructures?
c) What does the project suggest to manage the existing waste lands?

D.3 Urban design strategies

D.3.1 Layout (continuity of urban fabric and pedestrian and bicycle routes)

a) Does the design create continuity with the existing streets and pedestrian/bicycle routes?

b) Does the layout provide for clear orientation of pedestrians?
c) Does the layout allow easy and safe walking through the site?
d) Does design allow new users to know where they are and to find their way around, to enhance the feeling of security?
e) Is the building arrangement compatible with the surrounding urban fabric?

D.3.2 Specific location of activities

a) Are there sufficient activities or residents and users to provide spontaneous surveillance on every street and public space?
b) Are the services linked to housing (bicycle rooms, laundries, meeting rooms etc.) located in a way that they can contribute to spontaneous surveillance?
c) Does the location of commercial activities create vitality and natural surveillance?
d) Are pedestrian and bike routes designed in a way as to enhance vitality?

D.3.3 Time schedules coordination to guarantee continuous natural surveillance

a) Are the opening hours of the activities in the buildings facing public spaces able to provide continuous natural surveillance?
b) Are there any specific actions planned to provide safety during time gaps in the vitality?
c) Are there specific activities which can be introduced/ relocated to improve the time span of natural surveillance?
d) Do specific spaces need activity and lighting during night time?

D.3.4 Visibility (overview, sight lines between e.g. dwellings and public space, lighting, etc.)

a) Does design provide good visibility of building entrances?
b) Do landscaping and vegetation allow sufficient visibility and natural surveillance?
c) Are bus stops and entrance to underground stations and parking facilities located as to allow maximum visibility?
d) Are the activities on the ground floor provided with good visibility, to allow natural surveillance and calling for help?
e) Do façades provide visibility on public spaces from various floors?
f) Are long blind walls without openings along pedestrians' routes or sidewalks avoided?
g) Are spaces well lit to reduce fear of crime?
h) Is a good visibility provided on isolated areas in order to reduce the risk and fear of crime?

D.3.5 Accessibility (orientation, space to move, alternatives routes, limiting access for non-authorized people)

a) Are bus stops, entrances to underground stations and parking facilities located close to lively areas to reduce crime opportunities? Are there safe routes to reach them?
b) Are the accesses to public facilities located in lively areas so that their surveillance is enhanced and the flows they generate contribute to natural surveillance?
c) Does the project provide access control or restriction to problematic spaces and zones at risk (crime targets)?
d) Are there safe routes spaces accessible for disabled people?
e) Is good accessibility guaranteed for security and safety services (police. firemen, medical)?
f) Does the design provide clear accesses and routes, or is signage needed?
g) Are routes and paths designed taking into account risks and fear of crime for pedestrians?
h) Are parking lots located keeping safety criteria in mind?
i) Was flow considered in deciding whether it is necessary to separate public access from professional access (for facilities, commercial, leisure centres)?
j) Are the connections between the different buildings (paths, alleyways) conceived in term of safety?
k) To improve safety, is there a need of creating compartments in large building complexes or un-

derground parking?

D.3.6 Territoriality (human scale, clear public/private zoning, compartmentalization)

a) Is the difference between public, semi-public, semi-private and private spaces clear to users, in order to bring them into legitimate uses?
b) Is the separation between public and private spaces materialized, physically or symbolically?
c) Does the design of a space make clear the purpose of the space?
d) Have the spaces been thought for different target groups according to their needs?
e) Does this territoriality create feeling of ownership and responsibility among the users?
f) Is the scale of the new designed space in accordance with its purpose and uses?

D.3.7 Attractiveness (colour, material, lighting, noise, smell, street furniture)

a) Is the character of public spaces friendly for users, in accordance with common sense, to enhance appropriation by the users?
b) Does the project create attractive and useful places for people, to enhance sense of belonging and responsibility?
c) Does the project avoid creating nuisances that make the attractiveness of the area decline?
d) Does the design stimulate and allow for spontaneous activities?.

D.3.8 Robustness (materials e.g. street furniture, fences)

a) Does the concept and design allow for durable construction which minimize deterioration and maintenance?
b) Would the materials (benches, dustbins, and signage) be robust enough to resist to vandalism?
c) Is the use of robust materials compatible with their attractiveness?
d) Have the choice of materials been thought with crime prevention in mind (robust materials, replacing flammable materials for the risks of arson)?
e) Are they adapted to the needs of the users?

D.4 Management strategies

D.4.1 Target hardening/removal

a) Does the project provide for human and material security measures for spaces which have been identified as high-risk space or targets of crime?
b) Should the project plan specific accessibility, protection and compartmentalization of technical places, electricity, gas, water and telephone systems?

D.4.2 Maintenance

a) Are maintenance and management strategies and measures planned? Do the design and layout facilitate these?
b) Are maintenance measures planned so that spaces will be attractive and lively and generate a sense of responsibility and security?
c) Does the management strategy provide for stakeholders, steps to be taken and regular monitoring and assessment measures?
d) Does the maintenance strategy ensure quick, responsive and prompt responses to reduce the risk of vandalism, repetition of offences as well as to reduce feeling of derelict or unused spaces?
e) Are the different spaces within the area equally maintained to prevent the risks of crime to focus on some?
f) Does the management strategy provide for a partnership between the stakeholders to ensure homogeneous measures and implementation (regular meetings, specific document)?
g) Does the maintenance strategy ensure specific measures for lighting, electricity and telephone systems (regarding protection and quick repairs if needed)?

D.4.3 Surveillance (patrolling, camera monitoring)

a) Is there a security professional in the management staff?
b) Have the different measures of surveillance been studied and assessed (police, security services, concierges/janitors, block guards, on foot, by car, natural surveillance, Closed Circuit Television (CCTV)?
c) Have specific surveillance for public facilities access routes and entrances/exits been provided, during the day and during the night?
d) Who are the different stakeholders for safety and security? What is their own area of action and responsibility?
e) Does the project provide for a balanced set of surveillance measures, including the definition of public and private responsibilities?
f) Do specific places of the area require a surveillance to be supported by Closed Circuit Television (CCTV system)? In these cases, does the CCTV system provide for regular monitoring and assessment measures? Is the connection between the surveillance professionals and the management stakeholders organized, to reinforce the effectiveness of both parts?

D.4.4 Rules (for conduct of the public in public spaces)

a) Does the project define and communicate clear rules for the use in public spaces?
b) Do users perceive easily and plainly those rules defined by managers?
c) Do those rules increase the sense of responsibility towards the space?
d) Is the application of the rules checked and overhauled by managers and surveillants?
e) Is it necessary to foresee actions of communication between managers, surveillants and residents or users of the space?
f) Is it necessary to distribute a document which would clarify the rules in terms of maintenance and prevention of crime?

D.4.5 Providing infrastructures for particular groups

a) Does the project take into account the whole population on site or likely to come on site (homeless, drug addicts)?
b) Does the project provide specific measures for these specific target groups (to see vulnerable persons for their route, creation of a reception and information center, and organization of focus groups)?
c) Does the project take into account the perception of the most vulnerable groups such as women, children or seniors?
d) Is it foreseen to create an appropriate partnership between social workers and managers?

D.4.6 Communication (of preventive messages and rules of conduct for the public)

a) Does the project include the provision of information to explain the rules to the residents or users of public facilities?
b) Will users be in a position to easily get information and to ask managers for help or assistance?
c) In order to improve the feeling of security for residents and to reduce risks of crime is it necessary to communicate the prevention measures?
d) Which actions to increase public awareness will be implemented for potential users and specific populations (like juvenile groups) in order to increase the sense of responsibility toward the new area?
e) How will the current users or residents of the existing neighbourhood be involved in the project so they are encouraged to use the site and not vandalize or attack it?

Annex table 2 Table: recommended resistance class of products CEN/TS 14838-3:2005: 8)

Product	European Standard	Level of protection				
		1	2	3	4	5
Entrance dors [a]	ENV 1627	Class 1	Class 2	Class 3-4	Class 4-5	Class 5-6 [b]
Security lock	EN 12209	Grade 2	Grade3	Grade 3	Grade4	Grade 5
Cylinder for lock [b]	EN 1303	Class 4	Class 4	Class 4	Class 5	Class 5
Security lock furniture [c]	EN 1906	Class 1	Class 2	Class 3	Class 4	Class 4
Accessible window	ENV 1627	Class 1	Class 2	Class3	Class 4	Class 4
Accessible glazing [d]	EN 356	Class P4A	Class P5A	Class P6B	Class P7B	Class P8B
Shutter used to protect accessible window or door [e]	ENV 1627	Class 1	Class 2	Class2	Class 3	Class 4
	If the shutter is used together with a burglar resistant window or a door, the resistance class can be reduced					
Window or door which only can be reached with a climbing device [f]	ENV 1627	-	Class 1	Class 2	Class 3	Class 4
Glazing which only can be reached with a climbing device	EN 356	Double glazing	Double glazing	Class P4A	Class P5A	Class P6B
Alarm or intrusion system	EN 50130, EN 50131-1	-	Grade 1 (Optional)	Grade 1 (Optional)	Grade 2	Grade 3
Safe	EN 1143-1	Required when the valuables exceed a specific amount				

[a] If door leaf and frame are strongly constructed, a single point locking system should suffice up to resistance class 3. If door and frame are weaker, a multipoint locking system should be used on doors of resistance class 3 and higher.

[b] Doors in resistance classes 5 and 6 should be tested with the security lock and lock cylinder fitted, in accordance with the requirements of ENV 1627.

[c] The components are always examined fitted e.g. a door with the frame, hinges and the lock. Doors in the resistance classes 1 to 4 the user can select the lock cylinder and the security lock fitting, for these classes, components are also tested separately (see EN 1303 and EN 1906:2002, Annex A). Doors in the resistance classes 5 and 6 lock cylinder and security lock fitting are a part of the tests in accordance with ENV 1630.

[d] Glazing of building parts in accordance with ENV 1627, resistance class 5 and 6 should be protected against attack with angle grinders.
For protection against attack by firearms or explosion glazing should comply with:
EN 1063: Resistance against bullet attack
EN 13541: Resistance against explosion pressure
The documents mentioned above describe only the qualities of the glass themselves. The requirements for complex components are described in the following documents:
EN 1522: Bullet Resistance, EN 13123-1: Explosion resistance, Shock tube or EN 13123-2, Range test.
EN 356, EN 1063 and EN 13541 cover security levels of glazing but not fixing, which should comply with relevant manufacturers' recommendations.

[e] Shutters can be used together with a tested burglar resistant door or window. The two components can in this case have lower resistance classes. Note, only shutters in the closed position have burglar resistance characteristics.

[f] Balconies on higher floors can often be reached by experienced burglars.

Annex Table 3: Coding structure of the evidence-based policing matrix (Center for Evidence-based crime policy

Attribute / Coding / intervention	Result	Rigor (based on SMS)	X-axis: Type or scope of target:	Y-axis: specifity of intervention	Z-axis: Level of proactivity
	SS=sign. Success	**M =moderat. rigor-**	**I=individuals G=groups**		**R=reactive**
	NS=non-sign.	**ous**	**MP=micro places**	**G=general**	**P= proactive**
	M =mixed	**R =rigorous**	**N=neighborhoods**	**F =focused**	**HP= highly proac-**
	SB=sign. harmful	**VR=Very Rigorous**	**J=jurisdictions**		**tive**

	Na=nation				
Crack house raids reduced crime for about 12 days; crime reductions decayed quickly (Sherman/Rogan 1995)	m	VR	MP	F	P
[…] 124 studies	…	…	…	…	…

Annex table 4: recommended modification for the BESECURE policy support platform and inspirational platform.

Attribute / Coding / Intervention	Result	Rigor 5-Level SMS	x-axis: Type or scope of target:	Y-axis: specifity of intervention	Z-axis: Level of proactivity	Crime type
	SS= sign. success NS = non-sign. M= mixed SB = sign. harmful	**1=weak 2 3 4 5=strong 6=qualitative**	**I=individuals G=groups MP=micro places N=neighbourhoods J=jurisdictions Na=nation**	**G=general F=focused**	**R=reactive P= proactive HP= highly proactive**	**N= narcotic B = burglary D = disorder V= vehicle T= theft […]**
model project for **heroin assisted treatment of opioid dependent patients**: effect: sustainable decline in individual delinquent behaviour of treated persons (Verthein et al. 2008)	ss	5; 6	G	F	P	N, D, T
[…] BESECURE database	…	…	…	…	…	…

Annex 3: Methodology for an urban security metric

Introduction

The purpose of the metric is to give an overview on the development of key indicators from three different data components: police registered crime data, urban risk factors, and resident's survey data. Each of these components is subdivided into categories (e.g. property crime, violent crime, social cohesion, built environment, urban risk factors), which in turn are comprised by a set of numeric indicators (e.g. frequency of police recorded aggravated assaults). The metric depicts the annual growth rate of each single indicator, as well as the overall growth rate (or net development) of the subcategories and the three security components. Graphs and colours show whether the development of an indicator indicates more or less crime related insecurities in a certain area of the city.

The metric has three panels I-III where different kind of information is given (Figure 9). Panel I names the 33 single indicators, and the scheme in which they are grouped together into eight categories and three components. The first component 'urban data' is divided into the category 'built environment' (with 4 indicators) and 'urban risk factors' (with 11 indicators). The second component 'police recorded crime' has three categories (property crime, violent crime and narcotics) with a total of 10 indicators. For example: 'battery' is an indicator of the category 'violent crime' that belongs to the data component 'police recorded crime'). The third component 'perceptions' also has three categories called 'social cohesion', 'social disintegration' (each with three indicators) and 'fear of crime' (single indicator).

Figure 9: Three panels of the metric.

Panel II contains the statistical information about these indicators, including value and annual trend-rates. The first column 'indicator value' displays what value the indicator had in the base year 2006. The indicators have different units of measurement such as *ratios* (e.g. of high rise/low rise build-

ings) *absolute numbers* (of crime incidents), *square measures* (of living area) and *mean values* (of survey scales). The column 'indicator value' informs, for instance, about how many incidents of 'bike theft' occurred in 2006 in this particular area of the city, or how many percent of all offenders where 'underage offenders'. The next columns show the annual change rates of these values in the time period from 2006 until 2011 (survey data points are 1999, 2001, 2010, 2012). For the base year 2006 the value of each indicator is set to 0. Like with a price index the annual change rates indicate the relative growth and shrinkage of a product or a group of products in relation to the base year, but it does not tell how much this product cost in 2011, or how much incidents of bicycle theft there were in 2011. To give an example of the annual change rates of bicycle theft: In the base year 2006 there were 226 police registered bicycle thefts in Freiburg's city area 111 (old city central) as the reader can see in the column 'indicator value'. In 2007 there were 17,7% less bike thefts (186) than 2006, and in 2008 there were 24,3% less bike thefts (171) than in 2006, and in 2009 there were 12,8% less (197) bike thefts then in 2006.

Some indicators displayed in panel I and II are risk factors whereas others are protective factors. Growth rates of risk factors are coded red, negative growth rates are coded green. With protective factors it is the other way around: Positive values are coded green, negative values are coded red. For police recorded crime of course all indicators indicate more crime. Therefore the colour of the annual change rate is green if it is negative and red if it is positive. Within the data component 'urban data' and 'perception' there are risk- as well as protective factors. Social cohesion is a protective factor, that is, growing values indicate more security, whereas social disintegration is a risk factor and therefore growing values indicate less security. 'Residential nearness' and 'average living area' are protective factors as well. Next to the column with the annual change rate are two spark-lines, illustrating the trend of each indicator (line chart) together with its growth/shrink rate (bar chart). To give an example of how to read the spark lines: In 2007/08 the chart line falls. In 2009 it goes up as the number of bike theft increased compared to the previous year but is still lower than in the base year 2006, where the line begins. The bar chart shows the rates of growth/shrinkage for each year compared with the base year (which is always 0). They are also colour coded considering whether they depict a protective or risk factor.

Although it is intuitive to compare the development of different security related indicators, the metric should be interpreted with great caution. A ten percent increase of two different risk factors does not imply that each risk factor has the same impact on the security situation in this area. In fact the metric does not make any claims about the strength of correlation between an indicator and e.g. the crime rate. It is also important to consider the absolute value in the column 'indicator value'. This adds meaning to the annual change rate. In the data of our showcase there has been a 500 percent increase of burglary in 2007 but this corresponds to an increase from 1 incident in 2006 to 6 incidents in 2007, which is a less alarming increase.

The trend lines in panel III display the average development of the eight subcategories (security indices I) and the three components (security indices II). If the index includes both protective- and risk factors the respective indicators are recoded so that they have a uniform direction indicating either more or less security. Security Indices I and II of 'urban data' and 'police recorded crime' indicate risks: increasing lines indicate more crime or the risk thereof. Social cohesion and social disintegra-

tion go in opposite directions as their names suggest. Both are merged into the collective efficacy index which is coded as a protective factor. Higher values indicate more collective efficacy = more cohesion and less disintegration.

Disproportionally large growth or shrinkage rates of a single indicator (outliers) can distort the average development of an index. For this reason the indicator 'burglary' is not included in the index for property crime and the overall crime index. To demonstrate the effect of outliers, the indicator 'high rise buildings' is included in the built environment index. In the base year 2006, two of all 632 residential houses in the old city of Freiburg had eight levels or more. In the following year there were five more houses in the same area so the ratio was 2 to 637. This corresponds to an annual change rate of -0,78 (rounded to -0,8 in the metric). In 2010 however one of the two high rise houses was demolished, which corresponds to a 50 percent drop in the annual change rate. Compared to the annual change rate of all other indicators within the built environment category (between -1,43 and 6,25 percent) this is a disproportional large value that distorts the mean development of all four indicators as the dip in the development line of the built environment index shows. Whether to include or exclude outliers from the index I and II is a matter of statistical and criminological consideration. Even a single tower block can have a criminogenic effect in an area so it depends on local expertise whether it is reasonable to include or exclude the outliers of this this indicator. In our showcase it is included for demonstrative purposes only. A second option is to weight indicators with outlying values.

How to set up the metric with your own communal data?

This manual describes how municipalities, neighbourhood managers, crime prevention councils, or other practitioners in the field of urban security can set up their own local security metric. Compared with some of the other approaches and tools described in this report the setup of the security metric is a relatively easy process, but of course it also has limited analytical capabilities. The assignment of resources necessary to create the metric depends on the availability of data, the number of included indicators, the update intervals, reporting periods, the number of areas the metric is projected to, and many other things. From our experience with the showcase we estimate that a similar metric (with 33 indicators for one borough) can be put together by a single employee within one week given that all the necessary data for each indicator are readily accessible. Once the data structure is set up, it will cost considerably less efforts to project the metric to additional boroughs. There is also a lot of potential to automate this process especially if many areas are monitored or if the reporting intervals are more frequent (e.g. monthly). Again this depends on the availability of data and the purpose of the metric. The metric can be set up in four steps:

Step 1: determine the purpose of the metric

The metric is not an end in itself. It should have a well-defined purpose. The purpose and the availability of data determines which indicators are to be included, how they are measured and defined, to which urban areas the metric is projected to (city wide, districts, boroughs), how long the reporting intervals are, what the base year of comparison is, and many other questions. Our showcase is based on rather random decision about all these questions as the purpose is to demonstrate its setup. Nevertheless it contains actual data and is fully operative in this regard.

An appropriate use of the metric is to present disperse statistical information to the public, policy makers or communal departments. As such it could be one element within the periodical safety and security report of a city. Another field of application can be evaluation and performance measurement. In any case the integrity of the data is crucial and the metric should be maintained by non-partisan organization, otherwise it is susceptible to political influence.

Step 2: Select and group indicators

Our showcase monitors 33 indicators grouped in eight different categories (such as violent crime and social cohesion). These categories are meaningful but abstract, that is, they cannot be observed and measured directly. What can be observed and measured directly however, are their underlying indicators. By definition an indicator is a quantifiable (or otherwise assessable) and measurable characteristic that marks the presence or absence of an otherwise non-observable phenomenon. The process of making non-observable phenomenon measureable through the use of indicators is called operationalization. Each category in the security metric has to be operationalised. There are only few general rules for this process as it depends on the nature of the category. Violent crime, for instance, apparently comprises criminal offences in which the offender resorts to some physical violence as a means to reach his ends. Within this category one could further distinguish between coercive violence and retaliative violence, or between sexual violence and non-sexual violence, as all of these types of violence have very different causes and consequences.

The decision which indicators are grouped together is determined by the purpose of the metric and by theoretical assumptions. In our showcase the category violent crime is composed of four offenses that are presumably of interest to the general public. It can be used for example to inform the public about the gap between incidents of battery and robbery in the city centre. From the point of view of crime prevention or prosecution this selection would make less sense as the crimes types are criminologically and forensically too diverse. For these purposes indicators would be grouped in a different way. Neither is the category in the showcase an exhaustive list of offenses that qualify as violent crime. The German police statistic includes about 50 different types of violent crime, some of which are relevant for urban security others are not.

The category ‘built environment’ represents the propensity of an urban area to produce crime regardless of other social factors. This category is based on theoretical assumptions and empirical research on place based and situational explanations of crime described previously in chapter 2 of this report. It states that certain urban architectural features can have a criminogenic or preventive effect. For example ‘residential nearness’ (measured by the indicator ‘percentage of buildings with one or two apartments’) is a protective factor against crime whereas the percentage of ‘high rise buildings’ is a risk factor. There are numerous other indicators that could be used to conceptualise the built environment category, such as signs of physical deterioration (broken windows). To conceptualise this category for the showcase, we used the best indicators that were available in the official statistics. For a more thorough assessment we recommend to conduct a structured documentation of criminogenic/preventive physical features with one of the broken windows assessment tools often used in criminological research.

The category 'urban risk factors' is derived from empirical research into the numerous correlates of crime. For the sake of simplicity we select our indicators from the Amsterdam criminogenity Monitor's 'short list of risk factors', as discussed in chapter 4.2 of this report (van Steden et. al. 2013:50). It includes very general risk factors identified in criminological meta-studies. There is not enough room here to review the research of every indicator. Neither does the showcase metric give any information about why or how strong these factors correlate with crime, not to speak of causing crime. The only thing that can be concluded from these indictors is that they indicate potential social problems like crime. The indicator 'percentage of males' for example is included because males commit more crimes than females. Freiburg is no exception to this global trend: for every female offender there are three male offenders in Freiburg (in 2011 there were 2402 investigated female offenders and 7286 male offenders). The percentage of male residents in an area therefore is a risk factor in the metric but it does not explain why males commit more crimes. Many of the indicators classified as risk factors in the metric correlate with each other on a multivariate level. That can lead to flawed interpretations about the predictive validity of an indicator. In Freiburg foreigners do not commit more crime than Germans as the indicator 'foreigners' could imply. But foreigners more often bear other risk factors (such as unemployment or a lack of social capital), which increases the likelihood that they become criminal. If controlled for other risk factors, the nationality, or migration status of a person is usually a non-significant, or a very weak predictor of crime.

The short list of the Amsterdam criminogenity monitor is a convenient starting point for developing a security metric. Yet, we recommend a more deliberate selection process when cities develop their own metric taking into account local idiosyncrasies and a more thorough understanding of urban correlates of crime.

The categories social cohesion, social disintegration and fear of crime are based on survey indicators. The city of Freiburg conducts representative surveys in which these concepts are included. As can be seen in the showcase, the monitoring period for 'perceptions' (survey data) is different than the monitoring period of police recorded crime and urban data. This is due to the circumstance that no other survey data is available in Freiburg. The wording of the survey questions is slightly different than the wording described in Figure 6 of chapter 4.3, and the scale used in Freiburg is short of one item. The values displayed in the metric are the means of the 5-point Likert Scale survey questions.

Collective efficacy is a powerful explanation for varying crime rates in different neighbourhoods of a city. The category fear of crime is measured by just one survey indicator asking respondents "how safe they feel when they walk in their neighbourhood at night?" More elaborate crime surveys ask respondents for crime specific insecurities and distinguish between different emotional responses to the threat of crime (worry, anxiety, fear, anger).

Categories can be added to or deleted from the showcase metric depending on purpose and data availability. It is important however that the formation of categories is a deliberate and transparent process that reflects the purpose of the metric.

Step 3: acquire data, consider geographical boundaries, and compile dataset

In order to fill the metric with information, data for each indicator must be collected for the entire reporting period (2006 until 2011 in the showcase) and for all areas. Simultaneously with the selec-

tion of indicators, the developer of the metric has to consider to which geographical unit every indicator can be projected to. The showcase metric shows the development of indicators within one of 41 boroughs of Freiburg (so called three digit areas). This is the area in the old city of Freiburg (code 111), which is notorious for its high rate of violent crime (mostly battery). Other geographical classification systems can be postcode areas, electoral districts, census areas or others. One of the advantages of the security metric is that different areas of a city are monitored thereby considering socio-geographical and criminogenic contexts within the urban environment. Statistical boundaries however are not always a good delimiter for social contexts. Grown neighbourhoods or crime hot spots can cut cross administrative units. Eventually it is a compromise between availability of data, existing geographical boundaries, and criminological considerations that determine which data will be acquired and to which areas it is projected to.

Another thing to consider is the unit of measurement of each indicator. Battery, for example, can be measured as the number of incidents, the number of offenders, or as the number of incidents (offenders) per 100.000 inhabitants. As a general rule the data should be collected in the least aggregated form available, that is, the absolute number of e.g. unemployed people instead of the unemployment rate because this allows for statistical operations in the back end of the metric. At the front end (what the user sees) the indicator values should be population based measures, that is, the absolute frequency of an occurrence in relation to some population. The Population does not necessarily have to be the total population of the geographical area. It can be meaningful to relate an indicator to a subpopulation, such as the total working force population (with unemployment rates), the total of suspected offenders (to determine the percentage of underage offenders), or the total of adolescents (to determine unemployment rates among adolescents). One could think that this gives the indicator more weight in the index, because the number of long-term unemployed adolescents in relation to the total (sub-)population of adolescents, is apparently higher than the number of long-term unemployed adolescents in relation to the total living population of the area. But since only the *change rates* are considered in the index, indicators with references to different populations can be compared in a meaningful way.

Another guiding principle is that indicators which are grouped together in one category should have the same measurement unit (e.g. either population based or absolute frequencies). This is important because the units of the indicator have an impact on the annual change rates, and annual change rates of different indicators can be compared with each other more intuitively if they refer to the same unit.

We recommend providing a code book together with the metric in which all indicators are explained in more detail, especially if indicators with different measurement units are included.

Codebook for indicators. All indicators refer to city area 111: Old City Mid

urban data	built environment (housing)	*residential nearness	Number of buildings with one or two apartments in relation to all buildings (percentage).
		residential anonymity	Number buildings with eight or more apartments in relation to all buildings (percentage).

		*average living area in m²	Average living area per person in m²
		high rise buildings	Number of high rise buildings (8 or more floors) in relation to all buildings (percentage).
	urban risk factors (Amsterdam Criminogenity Monitor)		**All indicators are percentages (except crowded housing)**
		males	Number of males in relation to total population
		adolescents and young adults	Number of adolescent (age 15-25) in relation to total population
		single parenthood	Number of single parents in relation to total population
		divorces	Number of divorces in relation to total population
		unemployment	Number of unemployed in relation to total workforce population (age 15-65)
		long-term unemployment	Number of long-term unemployed (>1 year) in relation to total workforce population (age 15-65)
		unemployment among young adults	Number of unemployed adolescents and young adults (age 15-25) in relation to total population of adolescents and young adults
		underage offenders	Number of underage offenders (< age 21) in relation to all investigated suspects of crime incidents in the area (also considers non-residents).
		foreigners	Number of foreigners in relation to total population
		Germans wmb	Germans with migration background in relation to total population
		crowded housing	Average living area per person in m²
police recorded crime	property crime		**All indicators of police reported crime are absolute frequencies of police reported crime incidents**
		bicycle theft	Aggravated theft of bicycle. Statistical reference key *4**3*
		shop lifting	Shop lifting (aggravated and non-aggravated): *26***
		pickpocketing	Pickpocketing *90***
		burglary	Theft by burglary of a dwelling 435***
	violent crime	battery	Culpable actual bodily harm 2240***
		aggravated battery	Culpable grievous bodily harm 2220**
		sexual offences	All offences against bodily autonomy 1000**
		robbery	Blackmail and use of force or threats against life or limb, robbery causing death, Theft and use of force to retain stolen goods, Attacking a driver for the purpose of committing a robbery 2100**
	narcotics	possession	General violations against § 29 BtMG including purchase of all listed drugs 7310**
		trade	Illegal trade and trafficking of narcotics according to §29 BtMG, including all there listed drugs. 7320**
perceptions (survey	social cohesion	people here help each other	Mean of survey variable with response categories: 1=completely disagree; 2= disagree; 3 = even; 4= agree; 5 = completely agree

	people here know each other	See above
	trusted neighbour-hood	See above
social disintegration	often conflicts	See above
	parents don't care	See above
	no shared values	See above
	no respect for law and order	See above
fear of crime	residents' feeling insecure	Mean of survey variable asking respondents: "how safe do you feel when you walk in your neighbourhood at night?" response categories: 1= very safe; 2=safe; 3=even ; 4= somewhat unsafe 5=very unsafe

Step 4: create the metric: annual trend rates, spark lines, indices I and II.

When the arrangement of indicators and categories is finished and all necessary data is accessible, the data set can be compiled with spreadsheet software. The spreadsheet structure in the back-end of the metric basically is the same as in the front end: rows represent the indicators columns the years. This is done on separate spreadsheet for each area to which the metric is projected to. Only a few calculations in the back-end of the metric are necessary in order to visualise the information given in panel II-III. The indicator value in the base year (I_0) is the point of reference for the annual change rates. Within each category they should have the same measurement unit (here: rates, absolute frequencies, and means). The urban risk factors are population based rates. To give an example: the indicator 'adolescents and young adults' (18,89%) is calculated by dividing the number of all adolescent between the age of 15-25 (which are 706 individuals) by the number of the total population in area 111 in the base year 2006 (which are 3737). This result is displayed in the front end in the column 'indicator at base year'. This rate has to be calculated for all years of the reporting period (here 2007 until 2011) by dividing the frequency of the indicator for the reporting year through the population of the area in the same year:

$$I_i = \frac{F_i}{P_i}$$

With: I_i= Index value in reporting year i; F_i = absolute frequency of the indicator in reporting year i; P_i = Population in reporting year i.

Some indicators of the category 'urban risk factors' or not divided by population total but by a subpopulation at a given time P_i^S (See codebook). When subpopulations are considered their quantity in the monitored areas must be known of course.

The results of I_i(here I_{2007} to I_{2011}), remain in the backend of the metric, except for I_0, which is reported in the column 'value base year'. The front end shows the annual change rates T_i of $I_i$calculated by:

$$T_i = \left[\left(\frac{100}{I_0}\right) I_i\right] - 100$$

T_i is the growth rate of the indicator in the reporting year i compared to the value of the indicator in the base year (I_0) expressed in percent. To give an example how to read the trend rates appearing on the front end (under the component 'perceptions'): the mean score of the survey question 'there is no respect for law and order in our neighbourhood' (1= completely agree; 5 = completely disagree) is I_0 = 2,04 in the base year (1999). In 2001 it is 3,3 percent lower (T_{2001}) and 2010 it is 0,5 percent higher than in 1999.

In the showcase metric the change rate for the base year is always 0 percent (as this is the reference point) and the annual change rates are accounted in positive and negative percentages. Another option for reporting the annual change rates is to set the value to 100 in the base year (instead of 0).

The difference between these two ways of representing growth rates is that falling rates are expressed in positive values < 100 and growing rates in values > 100. This is similar to price indices and therefore might be a more familiar way of depicting annual variations.

As noted before some indicators are risk factors and others are protective factors. Positive annual change rates of risk factors indicate that the risk of crime is growing in an area; positive change rates of protective factors indicate falling crime risks. Because this obstructs intuitive interpretation, change rates are colour coded in the front end of the metric. Positive values of risk factors are coded red, negative values are coded green. With protective factors it is the other way around: Positive values are coded green, negative values are coded red. In Excel this can be done with the function 'conditional formatting' that assigns colour formatting to cells with positive or negative values. The trend lines (line and bar charts) in the next columns of the metric represent the annual change rates of single indicators. In Excel (2010 or newer) the spark lines function creates these trend charts directly on the front-end sheet. For single indicators the source data can be selected directly from range of cells at the front end.

Security Index I and II in panel III are spark lines, too. All indicators of these average trend lines have to point into the same direction of either more or less risk for crime related urban insecurities. That means that protective factors (those who turn green when they increase) have to be inverted in the back-end of the metric where the raw data of the metric is stored, so that higher values indicate more risks regardless of what information the indicator represents (the only exception is social cohesion and social efficacy, where positive growth rates indicate less crime risks). To maintain intuitive interpretation of the single indicators this should be done in the back end of the metric. For example, higher values and growing chart lines of the indicator 'average living area' as displayed in the metric, should actually mean more living area, not less. In the data for the two spark lines 'development built environment' and 'urban data index' in the back-end, these values are recoded so that higher values actually mean more risk, i.e. less average living area.

To calculate the mean for a category k in the reporting year i use:

$$\bar{x}_i = \frac{1}{n}\sum_{k=1}^{n} x_{ik}$$

Whereas $\bar{x}_i$ is the mean of the category in the reporting year, k is the number of indicators within the category and x_{ik} is value of the k[th] indicator in the reporting year i. All indicator values of protective factors have to be inverted: $-(x_{ik})$. In Excel this can be done by putting a minus sign in front of the value within the formula for calculating the mean, e.g. MEAN([value1]; [value2]; [-value3]). Whit the mean values of a category for the entire reporting period the spark lines for the indices I and II can be drawn on the front end sheet of the metric. To calculate Indices II just repeat the procedure with all the indicator values you want to group together within the index (do not calculate the means for Index II by calculating the means of means of Index I). In addition to the chart line the showcase also specifies the numeric values of means for all indices II for the reporting years. The user can see that the eleven urban risk factors decreased by an average of 10,3 percent in 2011 (compared to 2006).

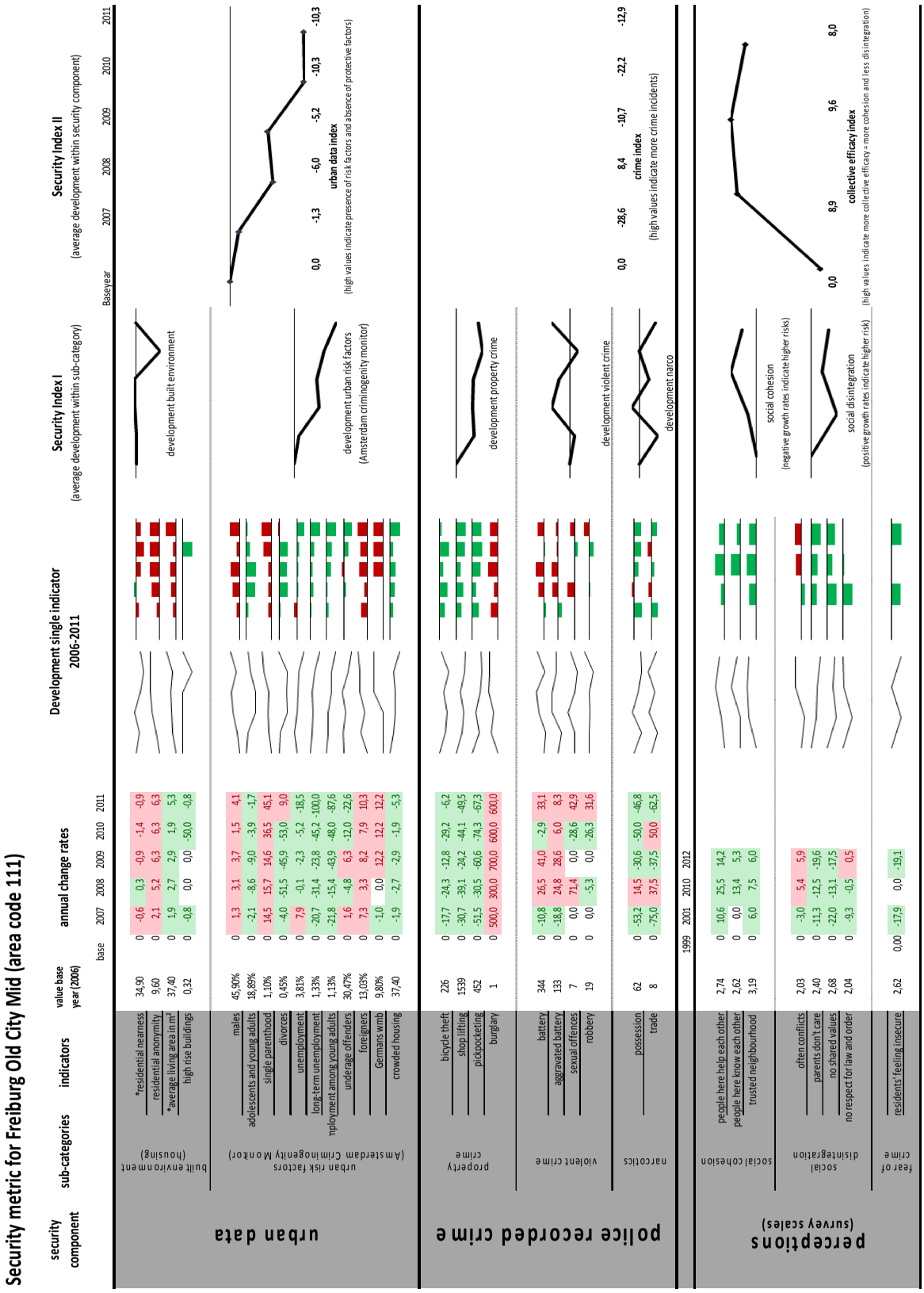

Figure 10: Showcase of the security metric with data for Freiburg's borough Old City Mid.