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KAIA KASK

Public sector real estate asset management models and their evaluation

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LIST OF ABBREVATIONS

ABC	activity-based costing
AEFAM	Association of Estonian Facilities Administrators and Maintainers
AGE	applied general equilibrium
AM	asset management
APT	arbitrage pricing theory
BCA	benefit-cost analysis
CAPEX	capital expenditures
CAPM	capital asset pricing model
CB	cost-based
CBA	cost-benefit analysis
CBR	cost-based rent
CE	centralized ownership
CEA	cost-effectiveness analysis
CEO	chief executive officer
CF	cash flow
CGE	computable general equilibrium
CMA	cost-minimization analysis
CPI	consumer price index
CRC	currency rate change
CRE	corporate real estate
CREAM	corporate real estate asset management
CREM	corporate real estate management
CUA	cost-utility analysis
DBR	declining-balance rate
DCE	decentralized ownership
DCF	discounted cash flow
DDM	dividend discount model
ED	economic depreciation
EVS 875	property valuation standard in Estonia
ESA	European system of accounts
FC	flotation costs
FCF	free cash flow
FDW	Fisher-DiPasquale-Wheaton
FI	fiscal impact
FIA	fiscal impact analysis
FM	facilities management (also, facility management)
GBE	government business enterprise
GPP	general-purpose property
GSA	government sector account
IPSASB	International Public Sector Accounting Standards Board
IRR	internal rate of return
IUS	initial unnecessary space
LCC	life cycle costs

MBR	market-based rent
MCA	multi-criteria analysis
NAP	new accounting principles
NGO	non-governmental organization
NIA	net internal area
NPFM	new public financial management
NPM	new public management
NPV	net present value
OCC	opportunity cost of capital
OPEX	operating expenditures
PD	physical depreciation
PfM	portfolio management
PM	property management
PPP	public-private partnership
PREAM	public sector real estate asset management
PREM	public sector real estate management
RE	real estate
REAM	real estate asset management
RICS	Royal Institution of Chartered Surveyors
RKAS	Riigi Kinnisvara AS (State Real Estate Ltd)
ROE	return on equity
SB	state budget
SCE	scale economy estimator
SLB	sale-and-leaseback transaction
SOC	social opportunity cost
SPP	special-purpose property
SRTP	social rate of time preference
TCO	total cost of ownership
TCT	transaction cost theory
TEGoVA	The European Group of Valuers Association
TVM	time value of money
VAT	Value Added Tax
YTM	yield to maturity

INTRODUCTION

"Omniam mirare etiam tritissima."

Carl von Linné (1707–1778)

Research background and motivation

The topicality of public sector[1] real estate asset management (PREAM) has originally emerged from problems with tight budgetary constraints of governments[2] and enhanced by the increasing understanding that property assets constitute a major cost category for the taxpayers. As the public sector provides a wide range of services to communities (including health services, community care, education, housing and criminal justice), the sector is by far one of the largest owners and occupiers of real estate assets in almost every country (Dent 2002). Therefore, it is probably not an exaggeration to say that in most countries governments hold bounded up with a vast array of real property assets that stretch from land and public housing projects to water distribution systems and office buildings – all of these play an important role in achieving strategic public policy objectives.

Typically, public property management is highly fragmented, with responsibility for each type of asset being assigned to a particular agency or bureaucracy. In almost all countries, various classes of property are managed according to their own rules, often following traditional practices rather than any assessment of what type of management is appropriate. Over the past decade or two, however, a new discipline has emerged that examines this important component of public wealth and seeks to apply standards of economic efficiency and effective organisational management. Despite their striking differences in institutional contexts and policy solutions, the issues of public property management are surprisingly similar in various countries. (Kaganova, McKellar and Peterson 2006: 2)

As mentioned, the public sector is usually tied up with a vast array of various kinds of assets. In this thesis the main focus is on real estate assets (referred to also as "real property") related to public sector activity. The author has considered as many complexities of real estate assets as possible. For example, besides the physical or asset aspect, real property has to do also with "rights" and the ability to bundle, alienate, transfer, and dispose of and otherwise control rights of occupancy and use. Property, whether public or private,

[1] Under the public sector it is considered a "core" government and all publicly controlled or publicly funded agencies, enterprises, and other entities that deliver public programs, goods, or services. Under the "core" government it is considered a governing body with a defined territorial authority, including all ministries, departments, or branches of the government that are integral part of the structure, reporting directly to the central authority. (The Institute of… 2011)

[2] Within this thesis, the term "government" refers to the general government sector given in ESA95 (2002), but mainly to the central government with budgetary public entities and state-owned enterprises.

transcends mere physical attributes and is inextricably linked to culture and society. Real property has economic, social, spiritual, and political value, and as Kaganova *et al*. (2006) states – those that deal with real property must understand these many dimensions and the opportunities and limitations that they represent (*Ibid*: 3–4).

The current economic state, where a number of governments (e.g., USA, Greece, Spain, Island, Ireland and others) have globally suffered under severe financial problems, it is particularly important to deal with public sector real estate management issues – how to manage public sector real property in the long-run in the most efficient manner for the society. For that purpose, it is possible to see the issue as the second wave of public sector real estate restructuring on the international level. At that, efficiency is defined as a way of economizing public sector real estate assets with the lowest possible average total cost in order to achieve maximum results in public sector administration.[3]

Looking at government balance sheets, it is evident that public sector real estate assets represent the largest portion of public wealth even in those countries that have been slimming down their property holdings. One of those countries is Australia, whose federal government is among the world's few advanced reformers of public asset management and who has privatized large sets of government property (Conway 2006 via Kaganova 2008: 2).

As governments have discovered the possibility to economize and lower the burden through more efficient public sector real estate management, reforms concerning public sector real estate are currently in a relatively fast stage of development in many countries, whereas the development has also been speeded up by the recent global market downturn. Beside Australia, there is also Canada, New Zealand and United Kingdom that have already employed some considerable conceptual frameworks for reforming asset management at all levels of public administration, whether central or local. Other countries, among them also Estonia, have drawn on the experiences of the early advanced reformers.

The main purpose of all of these reforms, carried out in different countries, has been to create economic incentives for the public sector to economize on premises. As so far every country has applied its own form of the public sector real estate reform, there is still some confusion on which is the best way of:

1) managing the set of public sector real estate assets;
2) the methodological handling of the issue of efficiency in public sector real estate management.

The objectives of a government, in any country and at any time, cannot be efficiently carried out without the management of a consolidated public fund. The central administration of finance is controlling and coordinating public funds and thus translating government policy into action. The handling of funds involves the operation of accounting, and accounting provides government with

[3] For more about efficient asset management see Grubišić 2009b, also Bond and Dent 1998.

its institutional memory of past financial events. Policy and the physical handling of funds belong to the realm of control. (Akotia 1996: 2)

The relevance of research on the topic of PREAM is accentuated by the considerable number of works that have been made so far. Nevertheless, by analysing literature on the topic PREAM, it is possible to reach to some major gaps in previous research become apparent. Plurality of research in the field is directed towards property asset management on the local, or more precisely, on the municipal level (see e.g., Hanis, Trigunarsyah and Susilawati 2011; Phelps 2010; Kaganova and Undeland 2006; Peterson 2006; Hentschel and Utter 2006; Schulte and Ecke 2006; Bertovic, Kaganova and Rutledge 2001; Kaganova and Nayyar-Stone 2000; Kaganova, Nayyar-Stone and Peterson 2000; Deakin 1996; Byrne 1994; Gibson 1994; Jenkins, Gronow and Prescott 1990) and the problems connected to the central government or to set of state real estate are underdeveloped. One possible explanation to this could be the difficulties in obtaining relevant research data, which has been referred to by many researchers (e.g., Kaganova 2008, Ilsjan 2006, Harris 2010), covering a whole country on the level of the central government (i.e., the central government assets have usually been located decentrally over the whole country). Therefore, the smallness of Estonia as a country is favourable for handling the topic as a separate case study.

On the other hand, one of the reasons why the central government real estate asset management may have attained a lesser attention, could be the obstacles that concern the difficulties in researching a certain type of additional risk elements coming from the national defence, which are not significant on the local government level, and which make the topic a bit sophisticated to handle. Although, those risk elements of defence regarding some state buildings in Estonia (e.g., the House of Parliament or the main building of the Bank of Estonia) are not elaborated in depth within this thesis, they are implicitly still taken into account in all parts of the thesis.

The mix of similar problems in various developed countries but distinctive strategies for addressing them provides the rationale for a comparative examination (Kaganova, McKellar and Peterson *et al*. 2006: 2). Structural problems across regional, state, and territorial governments that have legal powers to own and maintain real property are surprisingly similar, regardless of the level of development in each country. Even in most developed countries, improvements are urgently needed, beginning from a very basic level, such as property inventory records. (*Ibid*: 5)

Despite the remarkable similarities, there can be some complications in application, stemming from legal differences among countries. For example, in Roman-law countries, government-owned properties are divided into two major groups: (1) those belonging to the “public domain”, which implies that property cannot be alienated (i.e., sold or mortgaged) without special prior legal actions and also may have limitations on use and management arrangements, and (2) those belonging to the “private domain”, where publicly owned property is regulated similarly to privately owned property. In common-law countries, this

legal difference does not exist. (Kaganova, McKellar and Peterson 2006: 5) Such legal diversity is further increased by German and Scandinavian law, which combines elements of both common and Roman law (Management of Municipal Real estate Property 1999: 7).

As Bond and Dent (1998: 371) point out, it is always likely within public sector property holding that there is a potential conflict between profit-motivated property management and socially responsible property management. Better management of public sector real estate improves the fiscal transparency of the central government. On one hand, real estate is expensive to acquire and once acquired, somewhat inflexible to use. On the other hand, it is usually also expensive and time-consuming to manage and operate real estate. These aspects would lead to a reasonable expectation of public real estate receiving much strategic attention from the authorities. However, a questionnaire conducted by Schulte and Ecke (2006) among local authorities in Germany revealed that 51% out of 114 respondents found public real estate to be a major cost factor, especially when it comes to maintenance and management, and only 21% treat public real estate as a strategic success resource, which is in need of continuous exploitation and management. Furthermore, 22% of the respondents regarded public real estate to be a historical part of public assets and therefore find no need for reform. Others, 6% of the respondents, regard public real estate as a latent reserve, i.e., by selling off real estate the government can generate liquidity in the short-term. (Schulte and Ecke 2006: 234) To put the results into perspective another research, conducted by Gilber, Black and Moon (2002), revealed that only 16% of private companies' CEOs in the UK viewed property as a strategic resource.

Fundamentally, all these findings can be carried over to the central government's general attitude towards public real estate in most countries. For example, as Warren (2006: 3) states, reports published in the UK by the Audit Commission (1988a, 1988b), highlighting the shortcomings within the British public sector, indicate that property management was reactive and undertaken on an *ad hoc* basis, with "little thought or understanding of how the improvement would affect the value of the property". Managers had no incentive to optimize space use and were not undertaking property specific performance monitoring, which resulted in insufficient information on which to make informed decisions.

This thesis is based on the idea of the twofold view of the real estate market structure. According to this idea, real estate market is divided into two major subsectors, called the asset market and the space market. The idea is explained further in sub-chapter 2.3.1. This kind of view on division has been supported by many highly cited real estate researchers, e.g., DiPasquale and Wheaton (1992), also Fisher (1992), in their seminal works on the topic, Geltner and Miller (2001), Sivitanidou and Sivitanides (1999), and according to the opinion of the author of this thesis, it helps to explain and clarify many of the complex issues concerning the dynamic nature of the real estate market, which is also highly topical within the present thesis.

Figure 1 illustratively defines the main research objects of this thesis. In general, the state real estate policy is connected to three most importantly identified contextual dimensions[4] – i.e., management (specifically defined as public sector real estate asset management or PREAM), environment (defined as the general economy together with the real estate market), and direct space users (defined as the state employee). The central research object within this thesis is PREAM, which can be considered to be a sub-topic to the topic of the general management of the state government, and therefore it depends on general state policy, but more specifically on the state real estate policy.

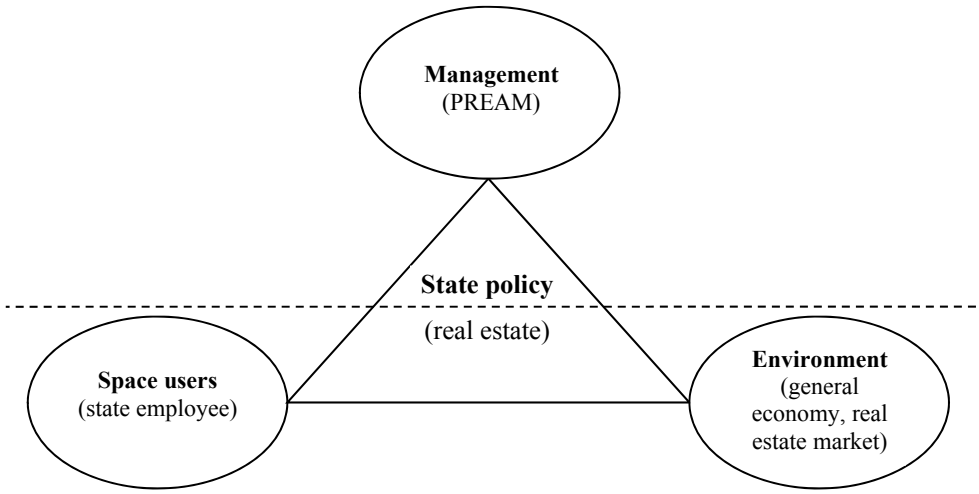

Figure 1. The identification of research objects within the dissertation (Source: compiled by the author.)

Although management as an action differs from the other two dimensions – space users and the environment – all three are directly connected to and influence each-other. For example, the number of state employees is regulated by the state policy, influencing the strategic decisions over state real estate asset management, which in turn may influence the general environmental condition on the real estate market (by increasing or decreasing demand in real estate space and in the asset market). In order to avoid the public sector dominative intervention to private market, EU directives[5] set that a government should not have any privileges and has to compete on equal grounds with the private sector. For that, various actions must be taken into account.

On the other hand, environmental conditions (both in the economy in general and on the real estate market) determine also the possible outcomes the

[4] The classification is based on Richard Daft's (1992) proposition to identify the categories of dimensions in organisation as structural and contextual.

[5] Competition policy and concerted practices are governed by Council Regulation (EC) No. 1/2003, in force since 1 May 2004. The EC Treaty regulates competition policy in its Article 81, which prohibits agreements between undertakings which have as their object or effect the restriction or distortion of competition.

state takes into account while making decisions over its real estate policy. For example, the timing of real estate asset privatization and its final results are influenced largely by environmental issues.

Generally speaking, at first this thesis explores the space requirements by a general government, thereafter the environmental conditions for achieving these requirements on the space level, and finally, the implementation of management issues of the existing set of public sector real estate assets on the example of Estonia is analysed.

The aim and research tasks of the dissertation

The aim of the dissertation is to elaborate on public sector real estate asset management models and evaluate their fiscal impact. Hereby, in this thesis, the term "model" refers to a set of qualitative parameters (or attributes), describing a certain kind of public sector real estate asset management (PREAM) scenario.

In order to achieve the aim, the following research tasks have been set up:

1. Elaborate on a theoretical conceptual framework for the research of the phenomenon of PREAM (Chapter 1).
2. Construct a base-model for PREAM (describing the situation as it is) and at least three comparable models, based on qualitative research (Chapter 2).
3. Develop the methodology and the analytical framework for the evaluation of the PREAM models (Chapter 2).
4. Evaluate empirically the fiscal impact of the PREAM models on the state budget (SB) and the government sector account (GSA), based on the set example of Estonian central government buildings (Chapter 3).
5. Present a synthesis of results from the conceptual framework (Chapter 1) and empirical research (Chapter 3) and make suggestions for the improvement of methodological approaches in the evaluation of PREAM models.

The main research object is real estate owned, used or disposed by a state's central government. In case at least one of the mentioned conditions holds, the asset is regarded as state real estate. In this dissertation, public sector real estate is defined as a collection of publicly owned, publicly managed and publicly leased real property assets. In addition, real estate that is owned by a non-private entity is also viewed as public sector real estate. As in many countries also in Estonia the central government is the largest owner and lessee of public sector real estate. Although publicly owned, managed and leased public land, waterways, roads, bridges and so forth can also be seen as public sector real estate, only public sector buildings as an example of real estate assets are considered in the empirical part of this dissertation.

The results of the study should give the implications of choices made within the PREAM to public sector fiscal policy. The results should also support the decisions made by policymakers on the government level, providing them with additional information about possible problems concerning real estate management. So that there they could make better choices on issues concerning public

sector real estate. As the principles of good management of government assets in modern democratic societies are relatively universal (Kaganova 2012), then the current research results should give relevant implications to those governments that have not gone through public sector real estate management reforms yet and are weighing the options of appropriate actions in the field.

Research methodology

Because there is a need for a solid theory on the PREAM, the methodology of this dissertation is based on a literature review and also on the best practices in selected countries that have been tested empirically on a set of state real estate assets in Estonia. Therefore, similarly to other studies in the field of public sector real estate management (e.g., Van der Scaaf 2002, Lindholm 2005), this study uses the approach of inductive reasoning by developing its own theoretical framework for the thesis rather than deductive reasoning by using already verified and confirmed theories.

Firstly, in Chapter 1, in order to validate the underlying context of assumptions, a conceptual framework of the study has been developed. That means the author has developed a framework for a theoretical concept to explain the phenomenon of PREAM. Later on, in Chapter 2, a detailed description of PREAM models has been given together with an explanation of measurements drawn from the methodology that are used for assessing the models. Finally, empirical testing and validation of PREAM models will take place in Chapter 3.

The most difficult part of research was to identify and finally develop the methodology appropriate for the study. The used research methodology is an exploratory study with strong experimental case study elements. Although the study is based mainly on quantitative analysis methods, some qualitative data gathering methods, like interviews, have also been used.

In order to evaluate the possible performance of reforms, outlined to be implemented on state real estate, a general theoretical concept of PREAM and also four basic PREAM models have been developed. According to these models, two basic views of a set of Estonian state buildings are analysed empirically; i.e., according to: (1) general-purpose property (GPP), and (2) special-purpose property (SPP). The results of the research are explained through the two main analysis methods[6] – i.e., benefit-cost analysis (BCA), and fiscal impact analysis (FIA), where discussion about the appropriate level of discount rate application to long-term cash flow forecast plays a significant role.

In order to answer to the research questions and propositions connected to the PREAM models, the following research methods have been used:

- Fiscal impact analysis (FIA), based on
  – state budget (SB) and government sector account (GSA).

[6] The explanation of the chosen methods is given in sub-chapter 2.2.1.

- Benefit-cost analysis (BCA), based on
  - cluster analysis[7] (i.e., public sector building types classification between the sets of property: general-purpose and special-purpose);
  - *pro forma* free cash flow (FCF) estimation, based on fiscal impact, forecasted in detail for at least 30 years;
  - the identification of the appropriate discount rate.
- Scenario analysis, based on
  - a twofold view on the classification of public sector buildings, dividing a set of state real estate into special and general purpose properties.

Therefore, the main methodology used in this thesis can be described as a model-based approach applied on benefit-cost and fiscal impact analysis, combined with scenario analysis. The conceptual basis for the methodology has also been driven by the general finance theory – i.e., time value of money and valuation theory. The general description of the applied methodological framework is displayed in Figure 2.

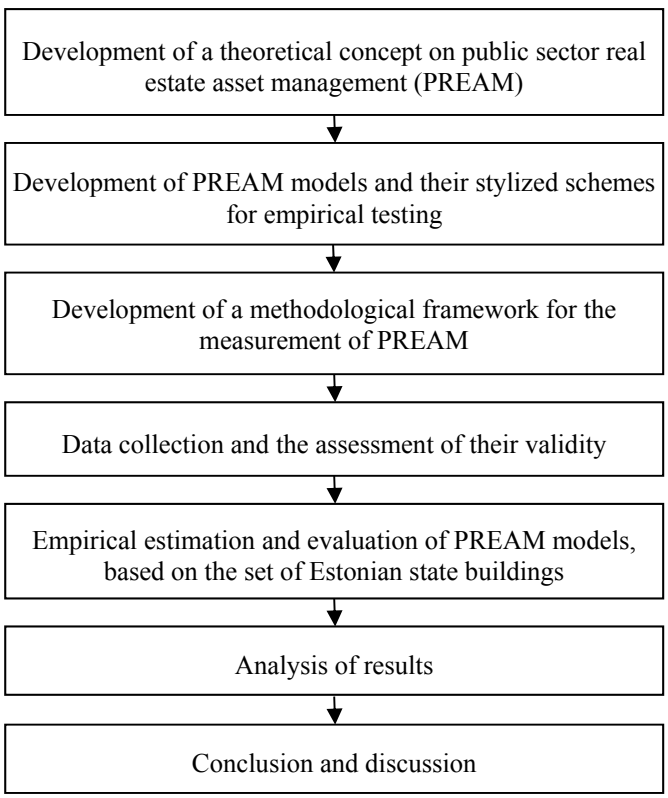

Figure 2. The general framework for the methodology used in the dissertation (Source: compiled by the author.)

[7] Cluster analysis is applied in this thesis indirectly, although a special methodology for direct measurement was worked out. Instead, the classification of assets was taken account in two scenarious as given by the Ministry of Finance.

Relevant research data was gathered:

1) via publicly available statistical databases, the public sector real estate registry, and macroeconomic baseline data for forecasting;
2) via many interviews conducted with public and private sector real estate specialists;
3) using various survey analysis methods and statistical analysis methods;
4) using real estate market expert opinion in collecting data which was not otherwise available for the author.

Firstly, a theoretical concept for PREAM is developed, based on a combined view of connected theories. Thereafter, a methodological framework for the measurement of PREAM together with PREAM models is worked out. Afterwards, the models are empirically evaluated and tested, based on the set of Estonian central government (state) buildings (both owned and used).

As already mentioned, the PREAM models are constructed based on theory, also by using the knowledge of the best practices of other countries, having experiences over the public sector real estate management reforms; and finally, on Estonian state policy on public sector real estate. The fiscal impact of the PREAM models on SB and GSA are analysed, by using FIA, BCA, and also scenario and sensitivity analysis methods. Within the benefit-cost analysis, a free cash flow to state budget and also to government sector account are calculated, using proactive forecasting period in detail for at least 30 years. In general, the current dissertation shows how to analyse the four possible ways of managing public sector real estate assets, known as the PREAM models. The descriptions of the PREAM models are derived from the best practices and from academic literature. The described models differ from each other mainly in terms of form of ownership of the assets, and the asset management strategy.

The empirical research is based both on qualitative and quantitative analysis methods. The qualitative analysis method is based on semi-structured interviews, conducted among real estate specialists in charge at all ministries in Estonia (see Appendix 1). The aim of the interviews was to explore the criteria for selecting an appropriate asset management model for public sector real estate. In order to maintain focus and gather comparable data, but also to leave enough flexibility for each interviewee to express their own thoughts and give some additional explanations about the topic, a semis-structured interview format was selected. Also, expert opinion approach was used to gather relevant information on market data (i.e., market rent and market value) not publicly available.

Empirical estimation techniques and the evaluation of PREAM models are based on a quantitative analysis method, using primarily BCA and also scenario analysis methods. The aim of the quantitative analysis method is to identify the suitable model for the PREAM. Within the cost-based analysis, the 30-year *pro forma* cash flow forecast for each model is drawn up and the impact of these costs on the state budget and also on the government sector account is calculated. The analysis is made using MS Excel software. Thereafter, to make

the models comparable to each other, the forecasted cash flow streams are discounted to the present value, using an appropriate discount rate for the state.

The author finds it reasoned to believe that the methodology used within the thesis, also the findings and conclusions made upon the analysis based on the set of Estonian state buildings, are universally applicable also in similar kinds of situations in other countries. In the best case, the problems concerning the implementation of the model-based approach on the cost-benefit analysis method in assessing the efficiency of public sector real estate management could help other countries to reach their desired objectives concerning PREAM issues.

Limitations of the dissertation

This dissertation is restricted by both theoretical and methodological limitations.

Theoretical limitations

Throughout the dissertation, an interdisciplinary approach has been used for a research method because there is no one solid theory with a certain supportive data frame.

The author explains the importance of the term "asset management" used in the title of the dissertation, through Haynes and Nunnington (2010) who state on the organisations' need to consider their real estate as an asset rather than a liability. By shifting the emphasis to real estate as an asset, the dialogue and communication with an organisation can relate to asset [value] maximization. This approach acknowledges that real estate is an asset in a financial sense, included in the balance sheet, whilst being also an asset in the operational sense, meaning it can lead to organisational performance. (Haynes and Nunnington 2010: xi)

Some of the theoretical limitations derive from the lack of relevant literature as, although new publications on the topic are continuously released, literature on PREAM is still limited. The vast majority of publications found on the topic have been dedicated to municipal, rather than state-level property asset management, also on facilities management and in lesser amount on the management of a whole set of real estate in the public sector. The majority of studies made in the field are qualitative rather than quantitative in nature.

Several researches have been conducted that describe the situation with public sector real estate arrangements in different countries (see Appendix 4). In developed countries, usually the reforms carried out during 1990s, are described. Studies conducted in countries with transitional economies mainly describe the transition of public real estate ownership through the privatization processes, but also elaborate on future plans, if there are any. Making some generalizations, one can find that research on topics concerning PREAM is mostly limited by qualitative analysis and no quantitative (summarizing) analysis has yet been conducted. Therefore, it is one of the motivations of this thesis to fill this void and by that to enrich the existing theoretical background to PREAM with a quantitative financial analysis.

The other limitation in relevant literature is to do with the fact that it is very much concentrated on research on municipal or local government real property asset management, and far less on state or central government issues. *Prima facie*, it may seem to have no difference in handling the topic (i.e., whether on the local or central governmental level), but there are still some essential distinctive issues between central and local government real estate assets to consider. Firstly, a central government owns assets that may be important for state security; that kind of issues are usually not considered when dealing with real estate assets on the level of local government. The other distinctive feature of central government real estate assets is that most often these contain also a set of buildings that have an important symbolic meaning to the country (e.g., the House of Parliament).

Surely, from the balance sheet perspective, the relative importance of real estate assets is usually bigger in local governments than in central governments (making the topic much more important on the local government level), but sometimes this can only seem so. For example, the real estate assets of the central government can be transcended to another form of ownership via state enterprises not recognized directly on the state balance sheet. Moreover, there are also different possibilities for treating a set of real estate in taking account asset financing possibilities (e.g., tax basis and other financing sources) – it is not the same for central and for local governments.

Despite the above-mentioned discrepancies, there are also many common features in local and central government real estate asset management techniques. For example, the main financial goal of asset management applied for the whole public sector is the same – i.e., to maximize the efficiency of assets. Therefore, the best practices and also the various results obtained through research carried out on local level real estate asset management can be in some extent successfully transferred to central government real estate asset management and vice versa.

There is also another type of limitation concerning the literature. Namely, because of the strong practicality of the topic, manuscript-type reports from the best practices of PREAM in different countries have been used, also several standards regulating different areas of the topic – e.g., European standards for real estate and facilities management, United Kingdom Publicly Available Specification on Asset Management (PAS 55–1: 2008), the international real estate valuation standards (IVCS), to only name a few.

Methodological limitations

The dissertation establishes a framework for efficient asset management of real estate in the public domain. One of the limits set within this dissertation concerns the term “public sector”. Within this dissertation, the term “public sector” encompasses the general government sector together with public sector corporations, like state-owned enterprises. The term “public sector real estate” takes into account all these properties that are related to public sector either owned, rented or leased. In its manual on government debt and deficit (ESA95), the

European System of Integrated Economic Accounts defines the general government sector as follows: "the sector general government includes all institutional units which are other nonmarket producers whose output is intended for individual and collective consumption, and mainly financed by compulsory payments made by units belonging to other sectors, and/or all institutional units principally engaged in the redistribution of national income and wealth." (2002: 10) In addition, it is also stated that the general government sector comprises four sub-sectors: a) central government; b) state government; c) local government; d) social security funds.

The other conceptual restriction concerns the term "real estate", which normally includes in the public sector context both central and local government real estate assets. However, the main emphasis here is only on central government real estate assets; i.e., local government or municipal sets of real estate are left out. Therefore, although the results of this research are applicable to all public sector real estate assets at all general government levels, only central government real estate has been considered in the empirical part of the thesis. In addition, the terms "public sector", "state" and "government(al)" will be used interchangeably throughout the thesis.

One of the major methodological limitations within the thesis is the chosen empirical analysis method. Because the essence of the PREAM is highly complex, the present thesis uses a somewhat reduced approach, surveying the PREAM only by using financial models. However, it still emanates from diversified dimensions, as the fiscal impact analysis (FIA) approach, based on benefit-cost analysis (BCA), enables to handle single factors in a sufficiently complex form. The author is aware of the alternative methods used to analyse and identify the public sector fiscal effects, e.g., computable general equilibrium (CGE) model or applied general equilibrium (AGE) model (see e.g., Cardenete *et al*. 2012, Burfisher 2011 and Borges 1986), but as it is also referred by Friedrich *et al*. (2012: 357), these models are not available in Estonia.

In addition to above said, the author has limited the conducted research in many aspects. Firstly, there is a recognizable model limitation – not all of the possible forms of PREAM models have been analysed, only the most typical ones. The main structure of these models is derived from academic literature and is based on the best practices of public sector property management in various countries. For example, some models based on private-public partnership (PPP) have been ignored because of the complexity in finding an unambiguous definition to the PPP model, It is a rather complicated to standardize PPP models and the subject should be handled separately as it clearly extends from the frames set for this research. The so-called Australian model of PREAM, where almost the entire public sector set of real estate was privatised has also been ignored. Also, a so-called securitisation model is ignored. By this model real estate assets are transferred in a special-purpose vehicle (SPV) and are thereafter exposed as collateral to the issue of securities. All of these examples are essentially the derivations of privatisation models for public sector assets.

Secondly, in the present thesis, a competitive neutrality of the central government is assumed. Competitive neutrality is an important consideration when assessing whether an activity is appropriate for government. Competitive neutrality means that government activities do not gain net competitive advantages over potential private sector competitors by virtue of their public sector ownership. Otherwise, if competitive neutrality does not exist, then resources are not being put to their best use for the benefit of the society. (Cost benefit... 2005: 7)

The empirical analysis is conducted based on the aggregated data of the set of the central government buildings, not considering the actual data of single real estate objects. The results derived via that approach may not reflect the situation in absolute correctness, leading to a deviation from actual data, but the aggregated form of analysis was inevitable because of the lack of actual single object data[8]. Another uncertainty from the analysis derives from the assumptions made concerning the 30-year and beyond cash flow forecast, as there is no absolute guarantee about the prognosis made for the future. It is important to mention that the empirical analysis concentrates only on the impact of direct real estate related costs to the state and on financing (i.e., how these costs are financed) is in direct terms left out from the analysis.

Within the present thesis, infrastructure objects have been left out from the analysis. Also, because of the extreme complexity, the analysis of new building developments has been ignored. Instead, the empirical analysis assumes that the state continues to use the same existing space (with renovations and restructuring) during the whole cash flow forecasting period.

Originality of the research

The present research contributes to the theoretical, methodological and also to the empirical level of academic research. The originality of the thesis is based on the lack of certain theoretical basis concerning PREAM. According to Hentschel and Utter (2006), public asset management is still in its infancy as a discipline and needs more research and inequity, especially on an international scale. It is perhaps, as the named authors suggest, by closer exploration of innovative approaches and models that the profession will be advanced (Hentschel and Utter 2006: 197).

Therefore, the main contribution of this research derives both from its theoretical and also from its methodological part. At first, within the theoretical part, the author has proposed a comprehensive theoretical framework for the PREAM concept to be handled in the empirical part of the thesis. Since, to the best knowledge of the author, there is no uniform understanding of the PREAM theory so far. Secondly, in order to solve the complex problem of PREAM on the practical level, a methodological framework has been developed within the

[8] Estonian government started to actively monitor the actual data of state buildings in 2012, after the establishment of the integral information system for gathering state real estate related data for budgetary purposes (see http://riigivara.fin.ee), developed by the Ministry of Finance in Estonia.

empirical part of the paper. The final result of the research is adaptable to all public sector properties that potentially produce income.

Four comprehensive and proactive management models have been created for the set of central government (state) buildings within the dissertation, focusing on describing the possible solutions for the application of the most efficient real estate management system from the financial aspect. The aim was to model the fiscal impact of direct benefits and costs of state real estate assets on the SB and the GSA.

The novelty of the thesis lies in the fact that there is no verification from earlier publications that any state has even tried to measure the costs related to a whole set of public sector real estate for the whole country, using quantitative research methodology. So far, based on literature, more attention has been paid on the level of the local government real estate asset management in PREAM research. In those cases, the main research method has been qualitative descriptive analysis. Therefore, the present research fills the gap in offering both a theoretical and a methodological basis for an original approach in quantitative measuring of direct fiscal impact of state real estate assets on the state budget and the government sector account, aiming to propose the best solution for the management of those assets.

Dissertation structure

The present doctoral dissertation is divided into three chapters. The structure of the dissertation is presented on Figure 3.

The first chapter is devoted to the framework of the theoretical concept. The objective of the theoretical basis of the study is to determine the main problems concerning PREAM, basing on relevant literature and theoretical concepts.

The second chapter explains the methodological framework of the thesis, dealing with the following sub-tasks:

- To build PREAM models for the empirical analysis, using both theoretical considerations and the best practices on an international level;
- To describe the benefit-cost analysis method applied in empirical analysis by using the model-based approach;
- To discuss the discount rate problem used in public sector investments as a relevant part of the benefit-cost analysis;
- To draw out the stylised schemes of the models and their mathematical descriptions by formulas.

The third chapter tests empirically the built-up methodology, dealing with the following sub-tasks:

- To analyse empirically the set of state buildings in Estonia, using previously formulated financial models and by forecasting the cash flow streams of the state budget and the government sector (balance) account up to at least 30 years (the analysis is made using MS Excel software);
- To draw out the main problems arising from the empirical analysis, consider their possible solutions, if any;

- To analyse the final results of the empirical analysis of the financial models;
- To make conclusions and suggestions.

As seen from Figure 3, the development of the theoretical conceptual framework of PREAM in Chapter 1 leads to the elaboration and construction of four PREAM models and their measurements in Chapter 2, which are finally empirically evaluated and tested in Chapter 3, in order to answer to the research question (RQ.2a) – which form of management and ownership of public sector real estate assets generates the least negative fiscal impact on state budget and government sector account? The result of the development of the theoretical concept is a bundle of instruments that define the measurement of the efficiency of PREAM within the empirical framework.

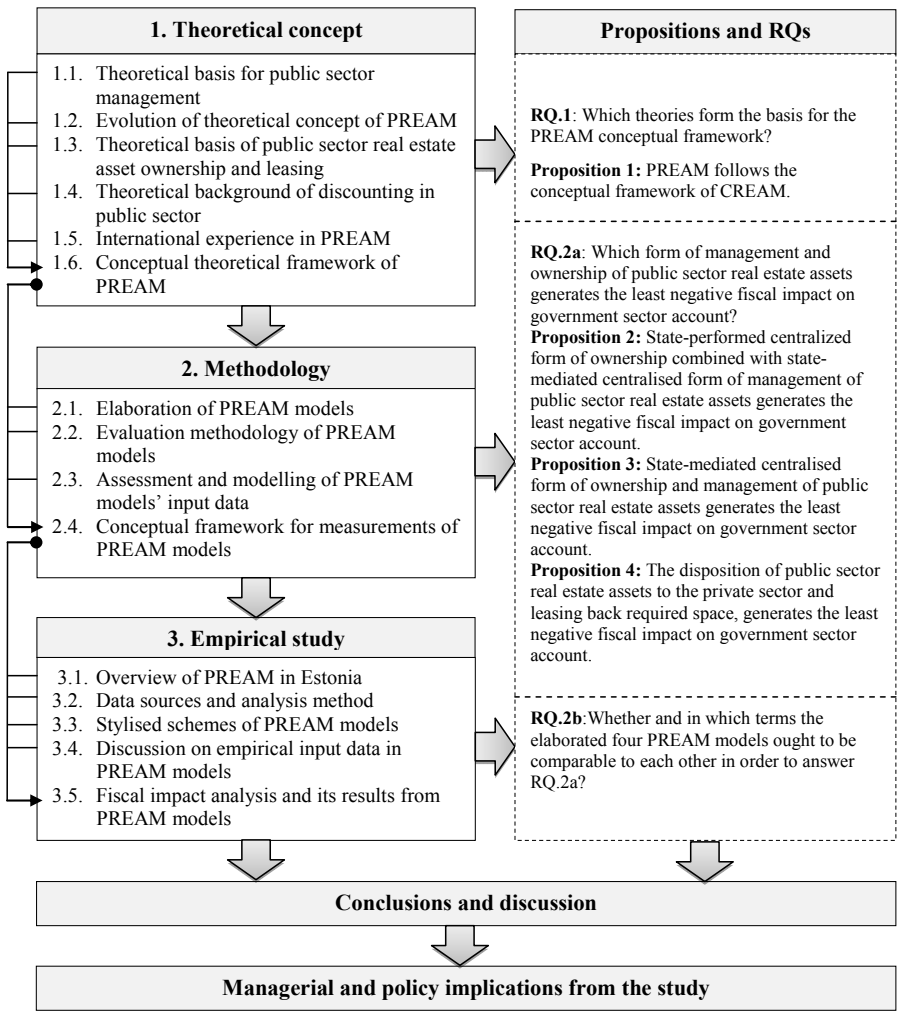

Figure 3. Dissertation structure (Source: compiled by the author.)

Acknowledgments

Hereby I would like to express my deep gratitude to my family and everybody who has helped to accomplish my doctoral dissertation in one or another way.

Above all, I would like to express my warmest gratitude towards my main supervisor – Professor Maaja Vadi from the University of Tartu. Thank you for the patience and for your continuous support during the long time-period of my doctoral studies! I would also like to extend my sincere gratitude to my second supervisor – Professor Emeritus Ene Kolbre from Tallinn University of Technology, who has been a valuable colleague and a good friend of mine already for many years.

This dissertation is based on material gathered through procurement work carried out for the Estonian Ministry of Finance, from August 2010 to April 2011. Hereby, I would like to express my infinite gratitude to all of the co-workers and group-members who participated in the project – Priit Sander, Oliver Lukason, Eduard Elbrecht, Aivar Tomson, Jaan Masso, Professor Urmas Varblane, but special thanks are going to my very best friend, Andres Luts, without whom the result of the project would not be the same.

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Last but not least – my warmest gratitude is going to all my dear colleagues from the Faculty of Economics and Business Administration, whose great support I have felt all these years.

Thank you so much to all of you!

Tartu, 30th of October, 2014

Kaia

1. DEVELOPING A CONCEPTUAL FRAMEWORK FOR PUBLIC SECTOR REAL ESTATE ASSET MANAGEMENT

1.1. Theoretical concept of the basis of public sector management

In the 1980s there was a move in a number of OECD countries towards New Public Management (NPM) (Hood 1995: 93), being regarded later as a new paradigm or paradigm shift in public management. As Yamamoto (2003: 1) depicts, the term NPM came into use at the beginning of the 1990s to describe public sector reforms in the United Kingdom and New Zealand, as a conceptual device invented for the purposes of structured discussions on changes in the organisation and management of government. According to Hood (1991: 5), the NPM has two main sources (or two fields of discourse or paradigms) – one is "new institutional economics", built on public choice theory, principal-agent theory and transaction theory, which views politics as a market phenomenon; and the other is "managerialism", whose ideas concerning public sector reforms emanate from private sector or business administration (Yamamoto 2003: 6). In principle, Barzelay (2002: 15) summarizes Hood's arguments with a statement that NPM is an umbrella term (Metcalfe 1998: 1), which encompasses a wide range of meanings, including organisation and management design, the application of new institutional economics to public management, and a pattern of policy choices.

According to Dunleavy *et al*. (2006) discussion about the "old" and "new" public management, the traditional theory of public management – without the term "new" – stated that politics is important for understanding how public organisations operate. Initially, public organisations were studied with the help of theories originally developed to explain the workings of the private sector, so there was not enough knowledge about the functioning of public organisations in a political context and therefore, public management theory brought politics into the analysis. NPM was a reaction to the traditional public administration theory[9]. Because of financial and fiscal problems, there was a need for ideas to innovate public organisations. Therefore, NPM emerged and as a result, public organisations were equated with private organisations, an entrepreneurial spirit was introduced into the realm, whereas the political dimension was left out. (de Vries 2010: 2–3) In a broader sense, by now public sector management can be seen as a complex of challenges, where the aim is to adopt the best possible solution via planning and checking, using scientific proof, engineering complex solutions, and using the best practices and codes of conduct (Lam 2014).

The development of public sector administration – from the traditional, classical public management model towards the New Public Management – has

[9] As James P. Pfiffner (2004: 443) says: "The traditional model of public administration rests in important ways on the articulation by Max Weber on the nature of bureaucracy."

entailed similar kind of developments in public sector real estate management, where the move has been made from property management and facilities management to more complex asset management and portfolio management issues, discussed in more detail in the next subchapter. In general, the emergence of the NPM concept has lead to drastic changes in the basis of PREAM in some countries (e.g., Australia and New Zealand) where the concept has been implemented during public sector real estate management reforms (discussed more thoroughly by Warren 2002 and 2003); similar kinds of reforms have been spread to and implemented also in other countries, although not in such a drastic way. According to Kaganova *et al*. (2006: 11–16), the need for PREAM reform in most countries is driven by the following problems:

1) the lack of central policy framework;
2) fragmented management of public property assets;
3) economic inefficiencies associated with public property;
4) lack of information needed for managing large sets of properties;
5) lack of transparency and accountability.

These problems are universal and therefore, the already worked-out solutions for them can be applied in several other countries. As follows, some major concepts and problems are discussed concerning and being related to the evolution of the PREAM concept, since the emergence of New Public Management and beyond. Therefore, the current sub-chapter aims to answer to the following research question (RQ.1):

RQ.1: *Which theories form the basis for the research of public sector real estate asset management?*

Since the general overview of major evolutional changes in the essential aspects of base theories influencing the development of the PREAM concept is explained on Figure 4, the following is an explanation to the illustrated trends seen from the figure.

Public sector financial management and accounting

The developments in public sector administration discussed above have led to changes also in public sector financial management and the accounting system. Therefore, it is possible to perceive also the shift from public sector financial management (PFM) towards the new public financial management (NPFM).

Public sector accounting management refers to various accounting systems used by numerous public sector entities – general (central and local) government-as-a-whole, government accounting units (i.e., departments, agencies, ministries, institutes) and government business enterprises (GBEs) that are referred to state-owned enterprises (SOEs) (Grubišić *et al*. 2009b: 330). A research conducted by Grubišić *et al*. (2009a) in Croatia allows inferring to a common understanding that public sector asset management reform should be accompanied by a public sector accounting reform. The named authors claim that "the lack of the reliable information on public assets in place hinders determination of the assets' value, budgeting for asset management activities and

evaluating the performance of public assets' holdings. As a result, assets are managed on ad-hoc, often reactive basis" (Grubišić *et al*. 2009b: 329).

Traditionally, general government sector entities have used cash-based accounting. But in 1990s discussions started over the benefits of accrual accounting. Since 1996 the International Public Sector Accounting Standards Board (IPSASB) has launched its *Standard Programme* focusing on full accrual accounting, but also addressing the needs of constituents reporting on a cash basis. (*Ibid*.: 330)

By now, there is a common understanding among scholars that the accounting reform has directly influenced also the asset management reform in various countries (see e.g., Kaganova, McKellar and Peterson 2006). Also, public sector transition from cash-based accounting to accrual-based accounting has triggered some controversial changes in property asset management. In accrual accounting for government, financial statements should report all assets, liabilities, revenues, expenses, gains, and losses. For capital assets, accrual accounting shows asset values and related debt. This implies that governments should identify and recur all their real property assets, attach a value to each piece of property, and then re-evaluate these properties on a periodic and consistent basis. (Kaganova, McKellar and Peterson 2006: 17) As capital assets are not capitalised on the balance sheet and depreciation is not recognised in cash accounting (Conway, Kaganova and McKellar 2006: 130), then the common perception under the cash-based accounting system has been that governments are consuming real estate assets as "free goods" (McKellar 2006b: 63). The shift of many public sector organisations across the world to accrual accounting is driven by the need to report also financial positions, and not just expenditures against revenues (*Ibid*.).

Although vast development has been enacted in the public sector accounting system during the last two decades, the recognition of economic value of government property still remains a conflicted issue. On the accounting side, only a few countries such as New Zealand, Australia and the U.K. have moved consistently towards recognising the market (or similar) values of government assets within accrual accounting. Sub-national governments in most countries, including Canada and the U.S., continue recording land at historic costs, which often leads to a major underestimation of what governments own. (Kaganova 2010: 32) Therefore, it can be stated that the reform and development of public sector asset management in a country should not be performed separately, but only in conjunction with the public sector information system, the accounting system included.

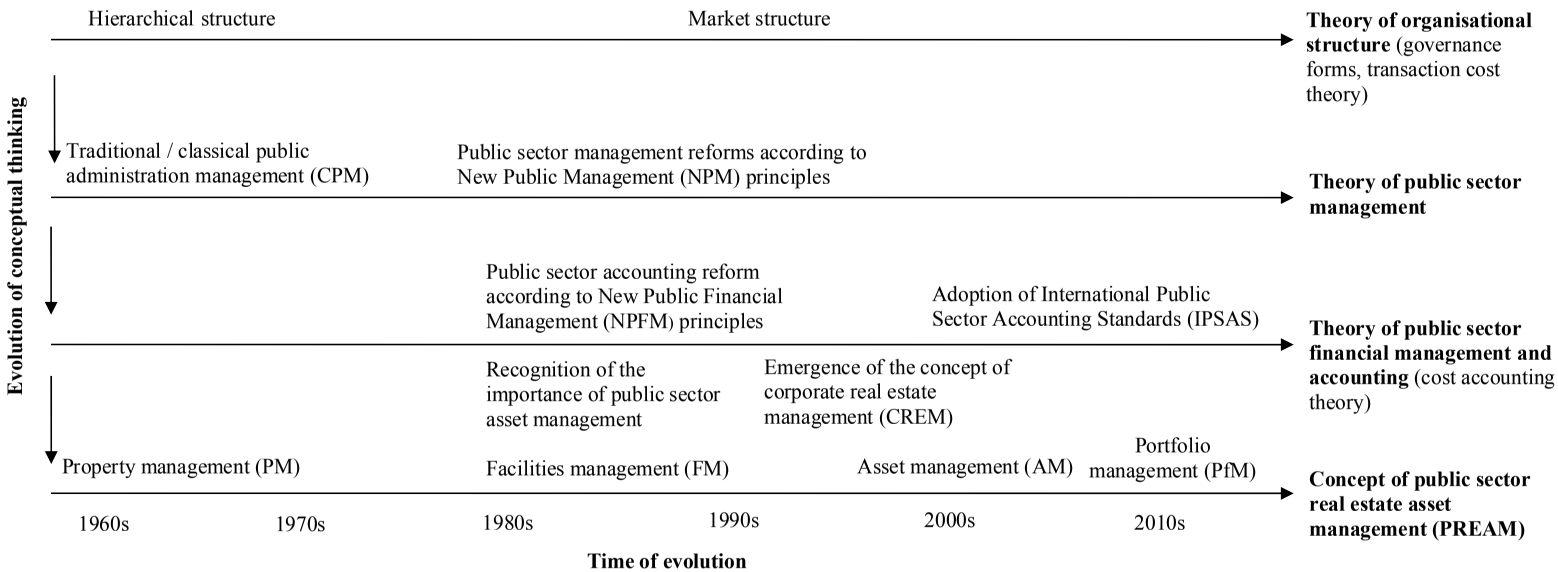

Figure 4. Time-frame for the evolution of essential aspects influencing the development of the concept of public sector real estate asset management (PREAM) (Source: compiled by the author.)

Theory of organisational structure

The main concern within the theory of organisational structure is how the system of the public real estate management is organised – whether the state follows a chaotic (market) system or prefers a strictly structured hierarchical organisational system. Organisational research of market systems and hierarchies is connected to the centralization or decentralization of a product or a service, concentrating mainly on the issues of cost-saving, concerning, for example, the problems of returns to scale, transaction costs, and contract costs. Therefore, the main question is – what are the costs of different models of economic organisation. From here, also a transaction cost theory was worked out. During the evolution of organisational structure theory (shown also on Figure 4), in between the hierarchical and market structure, different forms of governance evolved, e.g., hybrid alliances, partnerships, and other forms of market contracting, which are not elaborated on further in this paper.

Within the organisational structure theory, Lindquist (2004) and Lindquist and Lind (2004) have researched the structure of the management system for the properties that the public sector has chosen to own. Their case study was based on Sweden and the central issue, as Lindquist *et al.* claimed, is whether it is more efficient to manage these properties in a market-like way or through a more traditional hierarchical system. Hereat, a market-like system was defined as a system, where the user of the property, e.g., a school or a school department, has a large degree of freedom concerning the real estate they use, but where they also have to face the economic consequences of their decisions. A hierarchical system was defined as a system where the specific user, e.g., a school or a school department, must ask for permission for almost anything they want to do, e.g., renting a new premise or upgrading an existing premise. It was found that theoretical arguments can support both alternatives: a market-like system creates stronger economic incentives for the users of the properties, while a hierarchical system can have advantages in terms of better co-ordination of the use of real estate between different units.

Elaboration on the dilemma of centralization vs. decentralization

The question about efficiency is highly connected to the everlasting dilemma between the centralization and decentralization of various activities (usually concerning ownership and management issues in the public sector, but also in other issues in the private sector). In the private sector, an effective real estate strategy involves centralized financial responsibility for the overall set of real estate assets (Schäfers 1997: 306, via Schulte and Ecke 2006: 237). The benefits of this strategy are that the system as a whole is easier to control, and managers become more aware of what they are responsible for, and to whom they are accountable. Centralized responsibility, therefore, should also be beneficial for the public sector. (Schulte and Ecke 2006: 237) In times of budget shortfalls, the goals of public sector real estate management can be achieved more efficiently by reducing expenditure through more centralized property management (Simons 1993: 640). Failing to centralize financial responsibility may result in vague and uncoordinated efforts, with each player pursuing its own individual

real estate objective, clearly observed in the public sector (*Ibid.*: 41). Different characteristics of centralization and decentralization, according to space use, returns to scale and competency, are outlined in table 1.

Table 1. Main differences in centralized and decentralized public asset management system.

Characteristics	Centralized	Decentralized (in-house)
Space usage	Efficient / optimized	Inefficient
Return to scale	Existing	Non-existing
Competency	Centralized / aggregated	Decentralized / fragmented

Source: compiled by the author.

During the 1980s, together with the emergence of NPM, the discussion about decentralization increased in the public sector. Before that, with the development of the welfare state, an extensive centralization of tasks and responsibilities had taken place, but from the 1980s onwards the policy became "decentralization" – the enlargement of the formal policy freedom of local administrations. There are arguments that speak for centralization and those that back decentralization. First and foremost, an argument for the centralization of real estate management would be the ability to achieve a predictable effect of returns to scale, mostly in real estate related costs. Although the return to scale argument comes from the theory, the current thesis presumes and recognizes its applicability by default.

Just as centralization can take place in many ways, so can the decentralization. But first, it must be considered that there are several definitions for decentralization. To illustrate that, some of the possible approaches to decentralization are as follows:

(1) decentralization as a process or a situation (e.g., Falleti 2013, European Commission 1999);
(2) functional and territorial decentralization (e.g., De Leeuw 1982, Derksen and Schaap 2004);
(3) executive and strategic decentralization (e.g., Krumm *et al*. 1998); and
(4) deconcentration, degradation and devolution as a degree of decentralization (e.g., Michielsen 2010, Neven 2002, Parker 1995).

De Leeuw (1982: 241–243) and Derksen and Schaap (2004: 228) define decentralization as the process of transferring tasks and responsibilities to a local administrative layer. At that, Derksen and Schaap emphasise the change of the formal policy freedom of the local layer; i.e., decentralization is about the policy freedom local layers get in co-administration, about the systems of control on them and about the degree in which financial resources can be spent to their own choice.

In real estate sciences a distinction is made between strategic and executive decentralization (Krumm, Dewulf and De Jonge 1998). Strategic decentralization is about who has control in real estate management, executive decentrali-

zation is about the place in the corporation where real estate management is executed. The difference in territorial decentralization is that a decentralized task can be transferred to a lower level without being transferred to another layer of the corporation.

Neven (2002: 3) and Parker (1995: 19) outline different forms of decentralization: deconcentration, delegation, devolution and privatization. These can be seen as different degrees in which decentralization takes place. For example, as Michielsen (2010: 32) has shown, the degree of decentralization gradually increases from deconcentration to privatization, whereas responsibilities shift from the public sector to the private sector, with privatization having the highest level of private sector responsibility.

Property is one of the basic pre-conditions for an autonomous government, either state or local, and decentralization reforms are essentially dealing with the issues of property ownership (Péteri 2003: 12). In transition countries the transfer of state property to new owners has been implemented through restitution, privatization and property devolution. On the level of local government, the combined effects of these processes created various models with different scales and types of local government property. (*Ibid*.: 11)

While talking specifically about commercial real estate ownership, Linneman (1998) finds that it requires significant capital commitments and introduces added risk to the owner, including rigidness in operations and cash flow sensitivities to the commercial real estate market; an obstacle that can be largely reduced through an operating lease, discussed further in sub-chapter 1.3. What is important to bear in mind is that ownership is not a requirement for commercial real estate, and the market for services is usually well-developed with operating leases broadly available, i.e., ownership is an option, and the advantage to leasing is not implicit. (*Ibid*.)

In their pioneering work about corporate real estate asset management (CREAM), Zeckhauser and Silverman (1983) advocated that the CREAM structure can be (Kaluthanthri 2009: 22):

1) decentralized (where management of real estate is the responsibility of each department within the business organisation);
2) centralized (where all real estate decisions of the company are made in a centralized department within the business organisation); or a
3) wholly-owned subsidiary (where the control of some or all of the company's real estate is done by and transferred to a subsidiary of the business organisation or a specialized company under the ownership of the main company).

A decentralized structure is where the management of real estate is the responsibility of each department or functional area. A centralized structure provides central decision making at a particular level of the organisational hierarchical ladder. On the other hand, a wholly owned subsidiary controls some or all of the company's real estate as a separate business entity. Veale (1989) puts forward different views on this analysis and classifies organisational structure as profit centres and cost centres. Even though it is identified as a contradictory concept, a wholly owned subsidiary can be classified as a profit centre and centralized

and decentralized structures as cost centres of the organisation. (*Ibid*.: 19) Rutherford and Stone (1989) developed the idea of Zeckauser and Silverman and Veale about the formation of corporate real estate unit further.

Drawing these implications to the public sector, it can be recognized in practice that very similar kinds of management styles are also used by the governments of different countries. According to this, the following possible ways of real estate management in the public sector can be identified:

1) state (either centralized or decentralized) and
2) state-mediated (in most cases, centralized).

The same fundamental questions arise and are applied to the level of state real estate assets ownership structure decisions. The answer to the latter problem is directly driven by the general public sector theory, where two possible means of resource allocation are viewed: (1) market-based and (2) government-based allocation.

1.2. The evolution of the theoretical concept of PREAM

1.2.1. The essence of corporate real estate asset management concept

The evolution of the concept of New Public Management brought along the development of another concept, corporate real estate management (CREM), from which the public sector real estate management (PREM) concept have emerged. In order to obtain a better understanding about the concept of PREM, the essence of the CREM is elucidated on in the following paragraphs.

CREM is a discipline dealing with the management of a corporation's (organisation's) set of real estate, both in private and public sector organisations. Moreover, CREM integrates both asset management and facilities management[10], which are in many organizations often conducted separately by the general management. (Ilsjan 2007) One of the most important recognitions within the topic is that corporate real estate is not an investment, but a non-investment activity. Therefore, well-known and broadly applied investment management tools, based mainly on the risk-return dimension, should be considered with care in this regard. Within the current paper the issues and theories concerning portfolio management are considered relevant, as pertaining to the subject, but the topic of portfolio management itself is underdeveloped, as portfolio management is not the main discourse of this dissertation. On the other hand, a comprehensive overview concerning literature on CREAM) has been brought out by Oluwoye *et al*. (2001) and Louko (2006).

[10] Detailed description of facility and asset management is given in sub-chapter 1.2.2.

Within the field of CREM, real estate stock is assessed from different management forms, also called domains, which are – general management, asset management, facilities management and maintenance management (Van de Schootbrugge 2010: 10). In CREM the asset management domain is responsible for quantifying value. An asset is essentially a resource with certain characteristics held by a business. The main characteristics of an asset, outlined by Atrill and Mclaney (1997), are:

– the existence of a probable future benefit;
– an exclusive right of the business to control the benefit;
– the benefit must arise from some past transactions or event;
– the asset must be capable of measurement in monetary terms.

By definition and based on the above-mentioned list of characteristics, real estate can well be regarded to be an asset.

One of the well-cited facts about real estate is that in 1993, a study published by Joroff, Louargand, Lambert and Becker, identified real estate as the fifth corporate recourse after capital, people, technology and information. They found real estate to be a powerful recourse, being often the second most expensive cost after labour. As Brandt (1994) has brought out, the share of facilities in a typical private sector organisation was 23% of total assets, followed directly by labour costs with 40%. Most arguably these statements turned more attention to the relevance of the real estate issue within organisations and from there, the concept of corporate real estate asset management began to spread among practitioners and academics.

As Rogers (1999: 2) has pointed out, the recognition or discovery of real estate as the fifth recourse of a company was most probably driven by the paradigm shift in the focus of understanding over the role of real estate within a company. At the beginning of 1990s, the managers responsible for the management of organisation's real estate assets shifted their real estate focus from being a cost centre administration task to managing a central supporting resource that leverages greater organisational effectiveness whilst optimising operational expenditure.

Main topics considered in CREM are: 1) the choice between in-house management or outsourcing the real estate service, and 2) the implementation of the internal rent system. Before identifying CREM, and more specifically, also corporate CREAM issues, it is important to understand the essence of corporate real estate (CRE). Table 2 draws out different expressions and opinions about corporate real estate as developed by scholars.

Table 2. The proposed definitions of corporate real estate (CRE) throughout the development of the concept.

Study	CRE definition
Simpson and McDonagh (2010)	CRE is a significant asset, which has been shown to add value to businesses if efficiently and effectively managed.
Brueggeman and Fisher (2001)	CRE refers to "the use of real estate as part of business operations and associated activities".
Oluwoye *et al*. (2001)	CRE refers to "real estate owned by a corporation, also referred to as real property or physical facilities, or the buildings and land held by large organisations, both public and private".
Hiang and Ooi (2000)	CRE is both business (operational) properties and other non-business (investment) properties of a non-real estate corporation.
Brown *et al*. (1993)	CRE applies to "properties that are either owned or leased by firms to achieve corporate objectives".
Joroff *et al*. (1993)	CRE is termed as the "fifth resource" of business corporations/organisations, after the traditional resources of People, Technology, Information and Capital.
Zeckhauser and Silverman (1983, 1981)	CRE is "the land and buildings owned by companies not primarily in the real estate business".

Source: compiled by the author.

Stemming from the definitions displayed in Table 3, the common understanding seems to be that corporate real estate is an asset (both land and buildings, either owned or leased) that is part of a corporation not active in real estate business, helping to achieve its corporate objectives. At the same time, as Hwa (2003: 5) indicates, it is important to consider that the composition of the assets of corporate real estate vary according to what kind of business is carried out by the respective companies. The property type and scope owned by an organisation is dictated by the nature of its operations. For example, manufacturing companies would have factory premises, offices and warehouses. Companies involved in the service industries such as banks, insurance or travel agencies and so forth, would mainly own office buildings. Utility companies would own land reserves, rights of ways and easements for transmission lines and pipelines. The type of assets owned by governments varies from office buildings to infrastructure objects. Table 3 expresses the possible types of corporate real estate according to its business function.

Table 3. Types of corporate real estate (CRE) assets by business functions.

Business functions	Types of CRE assets
Administrative	Executive offices, general office, supporting office
Manufacturing	Fabrication, assembly, processing, refining
Utilities	Electricity generation, transmission, telecommunications, cable lines, microwave stations
Extraction	Mines
Agriculture	Farmland, timberland
Distribution	Warehouse, ports, pipelines
Retailing	Retail space, office, wholesale spaces

Source: Hwa 2003: 5.

Taken account that the administrative function is the main one in the public sector, a great part of the assets in the sector are types of office buildings. But they can also be warehouses and types of infrastructure assets. What is not included in Table 3, are various kinds of defence objects, which are not important assets for the private sector, but strategically very important assets for the public sector.

On the other hand, the identification and classification of CRE assets according to accounting terms is somewhat challenging, as some researches (e.g., Simpson and McDonagh 2010) have revealed. There can be as many as forty or more separate classes of assets classified as CRE (see Appendix 3) by the managements of companies. The general separation of CRE assets in accounting terms, being classified under property, plant and equipment (PP&E), would be: (1) land, (2) buildings, and (3) land and buildings.

Apart from the identification of corporate real estate, the issue of its management becomes into relevance. Table 4 summarises several opinions of scholars about the definition of CREM.

Table 4. The proposed definitions of corporate real estate management (CREM).

Study	CREM definition
Fuerst (2009)	"Most definitions of CREM state that its core task is the active, solution-oriented, strategic and operational management of properties regardless of whether they are necessary for a company's business operations or not. Thus, CREM typically only comprises the real estate management activities of non-real companies."
Lindholm and Leväinen (2006)	"CREM concerns every real estate and facility related issue in a public or a private organisation, whose core business is not in real estate business".
Ilsjan (2006)	"CREM deals with the management of a corporation's (enterprise's) set of real estate, in both, private and public sector organisations."

Study	CREM definition
Dewulf *et al*. (2000)	"CREM is the management of a corporation's set of real estate by aligning the set and services to the needs of the core business (processes), in order to obtain maximum added value for the businesses and to contribute optimally to the overall performance of the corporation."
Bon *et al*. (1998)	"CREM is the management of property that is incidentally held, owned, or leased by an organisation to support its corporate mission."
De Jonge (1996)	"CREM is the management of corporate accommodation in order to obtain maximum added value for the business."
Bon (1994)	"CREM concerns the management of buildings and parcel of land at the disposal of private and public organisations that are not primarily in the real estate business."
Brown *et al*. (1993)	"CREM is the optimum use of all real estate assets utilized by a corporation in pursuit of its primary business mission."
Nourse (1990)	"CREM is the management of real property assets for use in business other than real estate."

Source: compiled by the author.

Bon *et al*. (1998) state that corporate real estate management concerns the management of buildings and parcels of land at the disposal of private and public organisations that are not primarily in the real estate business, covering a range of activities concerning sets of buildings and land holdings: investment planning and management, financial planning and management, construction planning and management and facilities planning and management (Kishk *et al*. 2005). Inferring from the above definitions, CREM could be defined as "the strategic management of real estate held by a corporation or organisation, be it public or private, in pursuit of its primary business mission. CREM could be referred to as PuREM (public real estate management) or PrREM (private real estate management)" (Bakare 2010).

CRE strategic planning facilitates the development of CREAM, corporate real estate asset management, strategy that supports the overall business strategy (Liow and Nappi-Choulet 2007). By now, in the field of CREM, a remarkable number of surveys have been carried out in several countries and within several study areas, whether it has been private sector in the form of a single case study or, most often, a sample of corporations. In some cases research has also been carried out in the public sector. For example, since 1992 comprehensive studies have been carried out in New Zealand, allowing insight on changes and trends in CREM over that time. In general, the 1990's saw somewhat of an explosion of interest in CREAM as an academic discipline internationally and there are now a substantial number of individuals and research organisations working in this field (McDonagh 2008).

From Figure 5 it can be seen, how overall property can be divided into land and buildings and that land and buildings are the subset of the hierarchy of assets, forming a base for the asset management of an organisation. As Douglas (1996: 23) admits, a building has three primary functions: enclosure of space,

climate barrier-modifier, and also protection and privacy. Further, buildings are static over space, unless they have been or can be extended (vertically and/or integrally). However, buildings are not static over time, as they change, evolve and often adapt in response both to external factors, such as climate and exposure, and, more significantly, internal factors, such as use and maintenance.

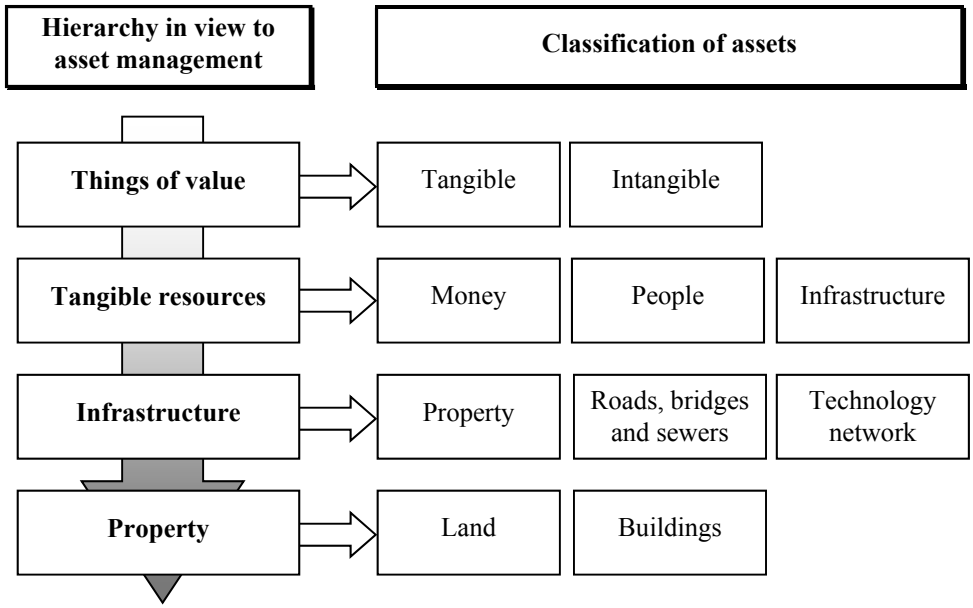

Figure 5. Hierarchical view of possible scope of real estate asset management in organisation (Source: adapted by the author from Phelps 2009: 77.)

In various empirical studies, corporate property is routinely identified as the second biggest cost within a business organisation after staff (see for example Veale 1989, Edwards and Ellison 2004, Zeckhauser and Silverman 1983) observed that most US companies treat property as an overhead cost "like stationary and paperclips". They found that 25%–41% of corporate assets are in real property and 40%–50% of net operating incomes are property related operating costs. Flegel (1992) estimated that between 20% and 35% of all US corporations' assets were real estate. Bruno (2002) found that amongst the Fortune 500 companies, real estate [value] accounts for 30%–40% of total assets and 5%–10% of operating expenses. Later, Bon, Gibson and Luck (2002) have also developed these arguments and suggested that real estate accounted for 10% to 30% of total corporate assets of major European and American corporations between 1993 and 2001. In summary, based on the latest estimates, it seems that CRE (at market values) represents in private sector, on average, around 20%–30% of total assets in the US depending on the sample, and in the UK it represents around 30%–35% of total assets (see Table 5). In Western Europe, these figures might in general be even slightly higher than in the UK. (Louko 2005: 63)

Table 5. Summary of the empirical findings of the relevance of real estate (RE) in the private and the public sector.

Study	Country / Study area / Time	Sector	Findings	
			relevance of RE to total assets	relevance of RE related costs
Kaluthanthri (2009)	Sri Lanka	private (banking)	60%–75% of total fixed assets	–
Bon, Gibson and Luck (2002)	Europe, USA (1993–2001)	private	10%–30%	–
Bootle (2002)	UK	private	34%	–
Nappi-Choulet (2002) ******	Europe	private	35%–40%	–
Bruno (2002)	Fortune 500	private	30%–40%	5%–10% of operating expenses
Nelson, Potter and Wilde (1999)	S&P 500 (1993)	private	19,7%–39,4%****	–
Breitensten *et al*. (1998)		private	> 50%	5%–10% of total turnover
Bannock and Partners (1994)	UK	private	–	16–20% of total costs
Johnson and Keasler (1993)		private	19%, based on historic balance sheet cost data	–
Flegel (1992)	USA	private	20%–35%	–
Avis, Gibson and Watts (1989), also Currie and Scott (1991)	UK	private	30%–40%	–
Veale (1989)	USA (a survey of 284 US companies in 1987**)	private	by average 25%, based on market values; 58% over 20%***	41%–50% of net operating income; 10%–20% of operating expenses
Zeckhauser and Silverman (1983)	USA (a survey of 300 US companies in 1981*)	private	25–41%, based on market values	40–50% of net operating income
Kaganova (2008)	Australia (mid 2003)	public	48,3%	–
Peterson (2006)	USA, Dallas, Texas (2003)	public, local	81,4%	–

Study	Country / Study area / Time	Sector	Findings	
			relevance of RE to total assets	relevance of RE related costs
Schulte and Ecke (2006)	Germany	public	–	15%–20% of administrative budget
Kaganova (2008)	Croatia, Varazdin (2000)	public, local	60%	–
Kaganova, Nayyar-Stone and Peterson (2000)	Czech Republic, Ostrava (1996)	public, local	93,3%	–

* So-called Harvard-study.
** So-called MIT-study.
***58% of the corporations in the study had real estate assets to total assets ratios of over 20%.
**** 19.7% out of corporate assets at historical cost and 39,4% out of corporate assets when adjusted for inflation.
***** It is not certain if the figures presented by Nappi-Choulet are based on real estate market values (Louko 2005: 64).

Source: compiled by the author.

Schulte and Ecke (2006) have found that typically, in private businesses, real estate costs normally range from an average of 5% up to 15% from of total costs; in the public sector, however, these costs are more likely to represent 15%–20% of the administrative budget (Schulte and Ecke 2006: 232). Since the first studies of CRE assets' share of total corporate assets in the 1980s, the results have shown a clear decrease in CRE ownership ratios (Louko 2005: 62). In comparison, Table 5 summarises the various empirical results of the findings of relevance of real estate both in the private and the public sector.

Occasional data assembled over the past decade confirms that government property assets constitute a substantial share of public wealth in most countries. Analysing the former centrally planned economies, these assets often made up of the general level a considerably bigger share of public wealth. (Kaganova 2010: 31) Illustrative examples of the typical shares of capital asset values in public sector balance sheets are shown in Table 6.

Table 6. Examples of capital asset values on the balance sheets of local governments in 2009.

Asset type	Los Angeles County (U.S.)	Warsaw (Poland)
Total assets (financial and capital)	100%	100%
Capital assets, total	67%	94%
Including		
Land and easement	28%	80%
Buildings, improvements	15%	8%
Infrastructure	20%	
Equipment	2%	Not available

Source: Kaganova 2010: 31.

Depending on the core business of an organisation, real estate managers handle their set of real estate differently. This is one of the reasons why real estate management (REM) has emerged into various specializations, like corporate (CREM) and public real estate management (PREM). They both aim to optimally attune real estate to the organisational demand, in which different disciplines or stakeholders are involved (see e.g., Figure 6). As Nourse (1990) states, corporate real estate asset management is the acquisition, management, and redeployment of real property to implement user objectives and in the process increase the value of the main business or businesses of the corporation (Nourse 1990: 1–2). Instead of measuring real estate costs only, CREM and PREM also signify the importance of creating revenue or generate income indirectly, but due to intangible aspects of real estate it can be difficult to address this so called "added value" of real estate (Van de Schootbrugge 2010: 5).

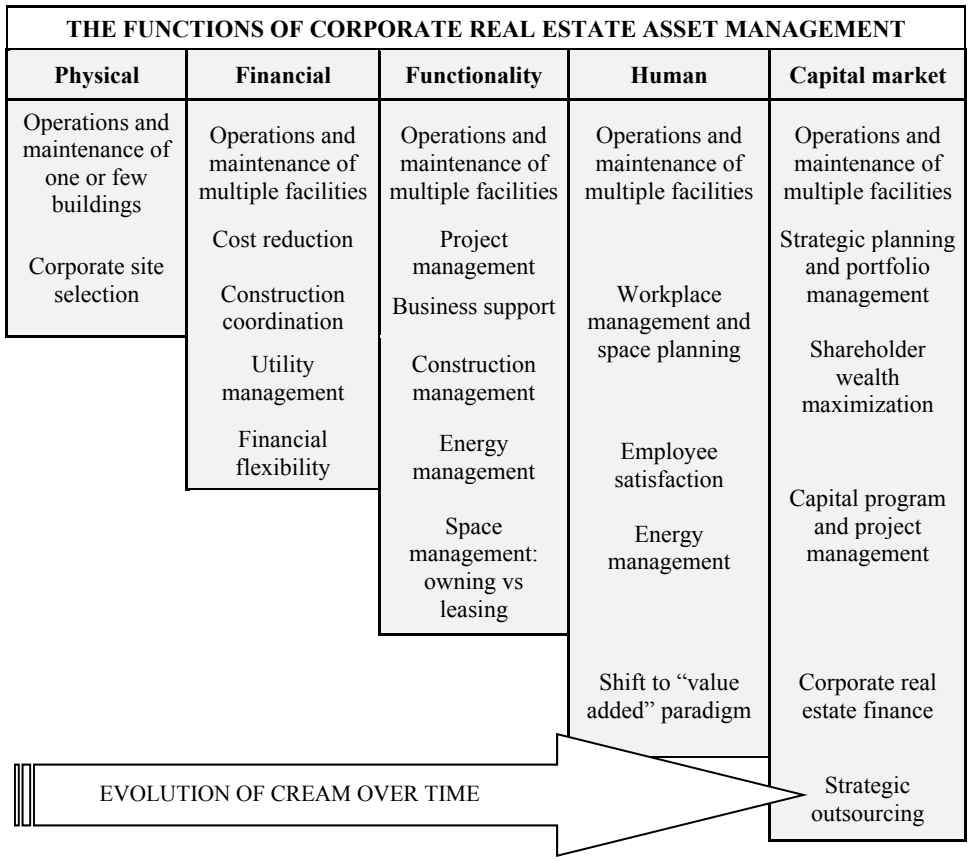

Figure 6. The evolution of corporate real estate asset management (CREAM) functions over time. (Source: adapted by the author from APPA 2002 and Committee on Core... 2008; Omar and Heywood 2010: 187; Liow and Ingrid 2008; Haynes 2007; Tipping and Bullard 2007; Gibler 2006; Lindholm *et al*. 2006; Brounen and Eichholtz 2005; Roberts and Daker 2004; Rabianski *et al*. 2001; Weatherhead 1997)

The built environment and, in particular, the buildings that provide essential public services play a key role in supporting human activity and delivering economic prosperity. Public sector buildings serve an important role in enabling the efficient delivery of public services, many of which are essential to the normal economic operation of the society. (Warren 2010: 245) At the basic level the buildings that a state occupies, are designed to provide the essential elements of an enclosed workspace, which affords security and a barrier to the elements (Douglas 1996).

There are a several studies (e.g., Then *et al*. 2014, Madritsch and Ebinger 2011), whereby researchers have identified the strategic impact of facilities management on business performance. The same argument is profoundly transferrable also on the public sector. CRE managers need to identify the

critical factors influencing CREAM performance (Veale 1989), therefore the topicality of measurement of performance by performance indicators has arisen during the last decade.

From the above discussion, the following research proposition has been proposed by the author:

***Proposition 1**: The concept of public sector real estate asset management follows the conceptual framework of corporate real estate asset management.*

1.2.2. Main functions of PREAM derived from CREAM

The modern form of REM can be seen from four viewpoints. These are, property management (PM), facilities management (FM), asset management (AM) (Leväinen 2001), and portfolio management (PfM) (RAKI 2001). Lately, also the issue of workplace management (WM) has been raised, but within the present research it is viewed as part of FM. According to Lindholm (2004: 13), in asset management the owner and investor concentrate on the profitability of business, in property management the technical manager concentrates on the building and its equipment, whilst in facilities management, the occupant of a workplace is interested in the space and services supporting their work or the company's production.[11] Similarly, the object of interest is different: capital (in AM), building (in PM), or space and service (in FM) (see Table 7).

Table 7. The essence and differences in property management, facilities management, asset management and real estate portfolio management activities.

	Property management	**Facilities management**	**Asset management**	**Portfolio management**
Object	Real estate as an object (building and the land attached to it (a lot/a plot) together with the rights and obligations bind to them)	Real estate environment and the services connected to it (ancillary services to support the core business)	Real estate asset from the investment perspective	Real estate asset from the portfolio perspective
Object of interest	Building	Space and service	Capital	Capital
Target group	The executor and customer of maintenance service (the owner and the user of the real estate object, the persons and organisations providing maintenance services)	User-organisation, occupant of a workplace	Owner and investor	Portfolio holder

[11] Property management – management of space by unit/building; facilities management – provision of support services to users and employees, stressing on environmental management of workplace; asset management – management of the set of assets.

	Property management	Facilities management	Asset management	Portfolio management
Target goal	Technical support service; handling of buildings and their equipment	The space and services supporting their work or the company's production	Profitability of business	Balance between risk and return
Space usage	Both residential and non-residential	Dominantly non-residential	Dominantly non-residential	Mainly commercial real estate
Time perspective	Actual age	Useful life	Useful life	Portfolio life-span
Management strategy	Passive	Reactive	Proactive, Value-based	

Source: EVS 807: 2010; Lindholm 2005: 13–14; Phelps 2009; complemented by the author.

Definition of property management (PM)

PM in general involves the dealing with only one property at a time; more specifically – it covers the activity of maintenance of the building during its operating stage. The well-discussed problems, both in theory and practice, with building performance indicators (PI) are closely integrated into activities concerning property management.

PM is the activity that ensures that matters of land and buildings are dealt with so that they operate efficiently. In effect PM delivers the strategic asset management objectives for land and buildings. PM is sometimes referred to as "operational" and it is the activity of undertaking professional/technical work necessary to ensure that property is in the condition desired, in the form and layout and location desired and supplied with the services required, together with related activities such as the disposal of surplus property, the construction or acquisition of new property, the valuation of property, dealing with landlord and tenant and rating matters, all at an optimum and affordable cost. It also involves offering advice to decision makers on the best ways of doing this. It has a customer orientation. It is normally undertaken by property, construction or facilities professionals and technicians. (Jones and White 2008: x–xi) Table 8 summarizes the proposed definitions to property management taken from the literature.

Table 8. The summary of proposed definitions for real estate property management (PM).

Study	Property management definition
Baldwin (1994)	PM is "the total care of a building during its operation stage; the extent of management service will vary according to the building's use, quality, size, location and age, the ownership profile, and the capability and strategy of the property management company itself".
Stansall (1994)	PM is "the valuation, acquisition and disposal of buildings, providing advice on property investments, the administration of leases, rental and service charges and the supervision of building repairs."
College of Estate Management (1995)	PM is "the application of management principles to property assets with the aim of maximizing their potentials''.

Source: compiled by the author.

Definition of facilities management (FM)

FM has been described as a hybrid management discipline that combines people, property and process management expertise to provide vital services in support of an organisation (Then 1999: 34). According to Tai and Ooi (2001), FM may be succinctly defined as "The integrated management of the workplace to enhance the performance of the organisation". It means that the main focus of FM is at the workplace (i.e., a place, where work is carried out) and efficient workplace management. In a broader view, the sub-activities that FM comprises, are asset management, space management, operational management, management of services, and also behavioural management (Nordic FM 2003, via Lindholm 2005: 15).

Facilities have a large impact on the environment, accounting for 40%of all energy use in the United States and 40%of all atmospheric emissions, including the greenhouse gases that have been linked to global climate change. Therefore, as the 21st century progresses, buildings and infrastructure that are efficient, reliable, cost effective, and sustainable will become even more important. (Committee on core... 2008) Table 9 summarises the definitions of FM found from academic and professional literature.

Table 9. The summary of proposed definitions for real estate facilities management (FM).

Study	Facilities management definitions
BS EN15221-1: 2011	Integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities.
Atkin and Brooks (2005)	FM is a profession that encompasses multiple disciplines to ensure the functionality of the built environment by integrating people, place, process, and technology.

Study	Facilities management definitions
NRC (2004)	FM is "as a systematic process for maintaining, upgrading, and operating physical assets cost effectively."
Best, Langston and De Valence (2003)	FM is the practice of integrating the management of people and the business process of an organisation with the physical infrastructure to enhance corporate performance.
Tay and Ooi (2001)	The integrated management of the workplace to enhance the performance of an organisation.
The US Library of Congress, via Amaratunga (2000)	FM is "the practice of co-ordinating the physical workplace with people and work of the organisation integrates the principles of business administration, architecture and the behavioural and engineering sciences."
Then (1999)	FM has been described as a hybrid management discipline that combines people, property and process management expertise to provide vital services in support of an organisation.
Liias (1998)	FM is the provision of the physical infrastructure necessary to best support the achievement of an organisation's primary objectives. It is a managerial service related to the continuous provision of space for working and living.
Barrett (1995)	FM is an integrated approach to operating, maintaining, improving and adapting the buildings infrastructure of an organisation in order to create an environment that strongly supports the primary objectives of that organisation.
Brown and Arnold (1993)	FM is concerned with coordinating the needs of people, equipment, and operational activities into physical workplace.
Definition of FM within this thesis	FM is the strategic management of the real estate environment within an organisation.

Source: compiled by the author.

In 2011, the European Union adopted the unifying standard, EN 15221: Facility Management (i.e., European Union standard series of EN 15221), which is compulsory to apply for all EU member states. From the broader view, the EN15221 standards define the European facilities management market. The definition of FM in EN15221-1 is formulated as "Integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities." (EN15211-1: 2011)

The EN15211-6 standard establishes a common basis for planning and design, area and space measurement, financial assessment, tool for benchmarking for existing and owned or leased buildings as well as buildings in the state of planning or development. The standard presents a framework for measuring floor areas within buildings and areas outside buildings. (Normative reference: ISO 6707 Building and civil engineering) After the implementation of the EN 15221, it is possible to benchmark cross-border facilities management quality as well as quantity, providing the data from all EU member states.

Definition of asset management (AM)

Up to now, the real estate asset management (REAM) topic is explored by many authors, both from the theoretical as well as from the practical point of view; the latter has been done both in the private and in the public sector. Although there is a lot of common understanding about the concept of REAM, it is still difficult to find a universally binding definition for it. Therefore, taking into consideration the aim of the thesis, the author has proposed a definition suitable for the research, based on relevant academic and professional literature.

Most commonly, the AM of public property is understood as the process of making and implementing decisions about property acquisition, use, management, and disposition. Until very recently, public property asset management had been very non-transparent, inefficient, and not sufficiently integrated in public financial management even in the most developed countries and their cities. Over the last decade, however, new approaches to public property have emerged that apply standards of economic efficiency and effective organisational management. (Kaganova 2008: 2) The definition given above shows, that AM encompasses a broader and rather different set of activities from maintenance management, which is primarily concerned with keeping existing equipment in operating condition. (*Ibid.*)

In 2008, the British Standards Institute (BSI) worked out and published the Publicly Available Specification (PAS 55) on AM. According to the PAS standard (PAS 55-1: 2008), AM is defined as "systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organisational strategic plan." PAS 55 states also, like already mentioned that the definition of asset management covers significantly more than just the maintenance or care of physical assets.

BSI PAS 55 is by now universally implemented in practice in the United Kingdom and it has become internationally accepted as an industry standard for quality asset management. The standard acts as a valuable guideline for asset life cycle management, quality control, and compliance. (Enabling the benefits of PAS 55… 2009: 2) The PAS 55 standard is split into two parts:

- PAS 55-1:2008 Asset management. Specification for the optimized management of physical assets; and
- PAS 55-2:2008 Asset management. Guidelines for the application of PAS 55-1.

It is said that, in order to be successful [in managing real estate within an organisation], it is vital that the PAS standard is implemented as an integral part of the overall business environment of that organisation. Data that should already be available on condition, performance, activities, costs, and opportunities is needed for the foundation of a successful implementation. It is also important that intangible assets are taken into account regarding reputation, image, and social impact. From a financial perspective, information about life cycle costs, capital investment criteria, and operating cost is essential. (*Ibid.*: 4) As the aim

of AM within an organisation is to support the strategic goals of the organisation (e.g., wealth creation of stakeholders), all levels of the AM system should be developed in a way that helps to achieve these goals, as it is described, for example, in BSI PAS 55 standard (PAS 55-1: 2008).

In addition to the BSI PAS 55, there is another guideline concerning AM, developed and published by the Royal Institution of Chartered Surveyors (RICS), also in the United Kingdom, from 2007. But unlike PAS 55, the guidelines by RICS are offered specifically to the public sector, giving an overview about its best practices.

Within the guidelines of RICS about public sector AM, it is said that AM is the activity that ensures that the land and buildings asset base of an organisation is optimally structured in the best corporate interest of that organisation. Also, AM seeks to align the asset base with the organisation's corporate objectives. This requires business skills as well as property skills, although only an overall knowledge of property matters is required. However, property input within the overall process is imperative, which does not seek to respond solely to the requirements of any particular operating part of the organisation, but rather, to take all requirements into account and to deliver the optimal solution in terms of the organisation's overall operational and financial goals. While AM has a consultancy and executive orientation, it is a corporate activity and may be led and/or coordinated by a property, construction or facilities professional, although this is not always the case. (Jones and White 2008: ix)

In the private sector, real property AM is the decision making process about acquiring, holding, and disposing of real property, which may be held for a company's use or as an investment. Asset (or portfolio) management is among the core business activity, supported by rapidly developing methodologies and advanced financial techniques. Its major goal is to maximize corporate value (or profits). In contrast, the traditional public sector goal of real property AM is to supply the right quantity of property for public goods and services at the lowest cost compared to alternative feasible arrangements, including private sector provision. The more recent non-traditional goals are to support local economic development and obtain revenue from alternative sources. (Kaganova, Nyyar-Stone and Peterson 2000: 3)

Given that AM represents an emerging discipline, as Phelps argues (2010: 171), which is distinctive from property management from which it originated, it is possible that there are alternative evolutionary paths for different organisations in their development that could explain also the plurality of different definitions of AM, as is seen in Table 10.

Table 10. The summary of proposed definitions for real estate asset management (AM).

Study	Asset management definitions
Kaganova (2010/2011)	AM of public property is understood as the process of making and implementing decisions about property acquisition, use / management, and disposition.
Hastings (2010)	Given an organisational objective, AM is the set of activities associated with: • identifying what assets are needed, • identifying funding requirements, • acquiring assets, • providing logistic and maintenance support systems for assets, • disposing or renewing assets, so as to effectively and efficiently meet the desired objective.
Creeley (2009)	"…AM is a property management tool adopted from the private sector that requires property owners to monitor and report on the financial, physical, and management performance of individual properties within a set of assets."
Phelps (2009)	"AM is concerned with managing public property strategically so as to optimize its benefits for the community."
Bosak, Mayer, Vögel (2008)	"Real estate AM is the discipline of systematically optimizing the returns of entrusted real estate assets by strategically managing them in their total life cycle and value chain."
Kaganova (2008)	AM of public property is understood as the process of making and implementing decisions about property acquisition, use / management, and disposition.
PAS 55 (2008)	"systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organisational strategic plan."
Jones and White (2008)	"...the activity that ensures that the land and buildings asset base of an organisation is optimally structured in the best corporate interest of the organisation concerned."
Jim (2007)	"A continuous process-improvement strategy for improving the availability, safety, reliability and longevity of assets; that is systems, facilities, equipment and processes."
Male (2006), via Harris (2010)	Property AM is defined "as a structured, holistic and integrated approach for aligning and managing over time service delivery requirements and the performance of property assets to meet business objectives and drivers..."
Kaganova and McKellar (2006)	"Property AM can be defined as the process of decision-making and implementation relating to the acquisition, use, and disposition of real property. The definition applies to both the private and the public sector, even though in the government sector, the term itself was not in common usage until recently."

Study	Asset management definitions
Bertovic, Kaganova, Rutledge (2001)	Real property AM is usually understood as a process of decision making about acquisition, holding, and disposition of real property for the owner's use and investment. This definition is applicable to both the private and public sectors (local government included).
Definition of AM within this thesis	**AM is long-term decision-making and implementation of acquisition, holding, using, and disposing of real estate assets in a way that minimises the overall costs to the organisation, but maintains the benefits for the community.**

Source: compiled by the author.

Derived from the definitions given in table 10, a definition for PREAM within this paper is defined as follows:

"*PREAM is long-term decision-making and implementation of acquisition, holding, using, and disposing of real estate assets in a way that minimises the overall costs to the public sector, but maintains the benefits for the community*."

Figure 7 depicts the differences between the more traditional property management and the newest discipline of AM. The two other sectors (quadrants) represent the alternative interim stages in the evolution from property management to AM, where the organisations can choose to increase their effectiveness in either short-term or long-term outlook (Phelps 2010: 163), using in their way of development also the facilities management discipline.

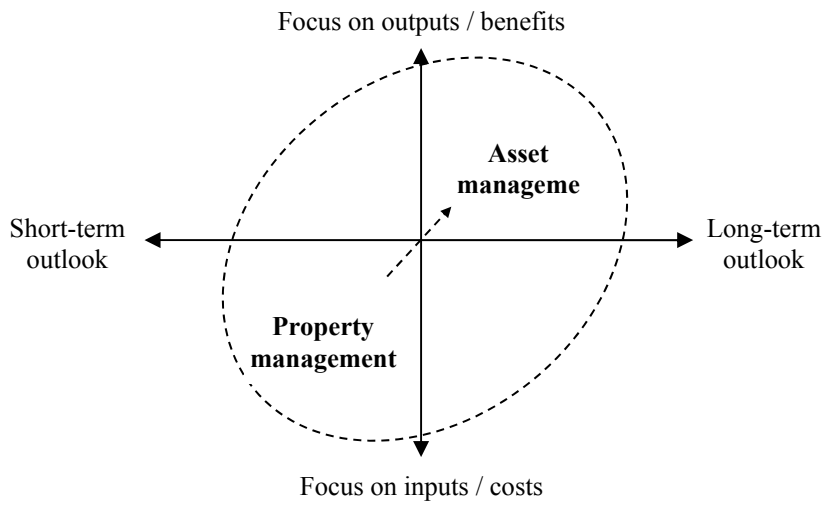

Figure 7. The visual definition and development of property management towards asset management (Source: Lloyd 2007; via Phelps 2010: 163; Phelps 2011; complemented by the author.)

Finally, a short overview of the comparison between PM, FM and CREM is provided in Table 11.

Table 11. The comparison of property management (PM), facilities management (FM) and corporate real estate management (CREM).

Scope	PM	FM	CREM
Objectives	Building maintenance.	Provide high-quality working environment to support business operation.	Strategic real estate activities to support business operation.
Activities	Day-to-day tasks; administrative management, market and physical management.	Acquisition and disposition, physical upkeep, record keeping, and reporting tasks to CRE owner.	The management of all aspects of real estate; acquisition and development, disposition, property management, financial analysis, surplus property, miscellaneous activities such as leasing and brokerage.
Users	Building occupiers / tenants.	Staff and workers in the organisation.	Stakeholders.
Management	Property manager.	Facilities manager.	Corporate real estate manager.
Skills	Property specialist, business administration and engineering.	Professionals with architectural, construction engineering, industrial engineering and operation management skills.	Property specialists with financial and management background.
Level of management*	Tactical or operational.	Tactical or operational.	Strategic or tactical.

*Depends on the structure of the organisation.
Source: Zaiton *et al*. 2008: 9–10.

Essentially, Table 11 illustrates the evolutional change of thinking from the relatively simple single-object maintenance view in property management to a much more complex conceptual strategic management view in corporate real estate management. PREAM has been through a similar change; more on that in the next sub-chapter.

1.2.3. Evolution of the concept of PREAM

As it was revealed in the previous sub-chapters, it is possible to find many common features between the real estate asset management of the public and of the private sector. However, despite the common features, it is also possible to draw out some relevant differences. A basic overview of the possible indicators for comparing private and public sector real estate management are shown in Table 12.

Table 12. Differences between public and private real estate asset management.

Indicators	Private sector	Public sector
Drivers	Profit motive, financial profits, competition	Social motive, social goals and policies
Financing	Customers	Taxpayers
Primary stakeholders	• Shareholders • Board • Employees • Customers • Suppliers • Local community	• Central, European and global government • Elected members • Special committees • Officers • Customers • Suppliers • Taxpayers • Local electorate • The general public
Corporate objectives	• Profit satisfying • Survival • Market share • Image	• Democratic and customer focused delivery of public services • Political advocacy • Sustainability (local economic development and environmental sustainably)
Purchasing objectives	• Cost reduction • Quality improvement • Innovation transfer • Environmental management	• Value for money / best value • Local economic development • Environmental improvements • Profile promotion • Cost reduction • Quality improvement • Innovation transfer
Purchasing legislative framework	• Code of ethics • Internal purchasing manuals • Environmental legislation • EU directives (privatized utilities)	• EU Public Procurement legislation • Domestic Procurement legislation • Standing Orders, Financial Regulations • Scheme of delegation • Code of ethics • Internal purchasing manuals

Source: Lindholm 2005: 39, based on Evers *et al*. 2002, Van der Schaaf 2002.

As already covered, in theory, PREAM incorporates the same disciplines as corporate real estate asset management, but there are major differences in managing the two (Van de Schootbrugge 2010: 12). While Table 12 brought out some general discrepancies, then Table 13 is drawn up in order to summarise more specifically the similarities and differences between CREAM and PREAM.

Table 13. Similarities and differences between corporate real estate asset management (CREAM) and public sector real estate asset management (PREAM).

	Differences	**Similarities**
CREAM	• The main focus is on return on investment • Jurisdictional difference on the operational level	• Share the same conceptual aims, considering dilemmas between "owning-leasing" and "inhouse-outsource" management • Use the same levels of handling (mission, strategic, tactic and operational) • Handling of different interests • An overlap on the operational level
PREAM	• The main focus is on public and political goals, - e.g., the goal is to achieve both economic and social return on investment, which complicates the comparison of alternative investments • Difficulties in measuring the performance of real estate because of its unique character	

Source: Van der Schaaf 2002; Ilsjan 2007; Van de Schootbrugge 2010; compiled by the author.

Although in basic elements CREAM and PREAM are relatively similar, one of the main differences between the concepts is the fact that public real estate has to fulfil public needs in a way that state authorities can achieve their set social goals. This is not a requirement for private real estate. The similarity between PREAM and CREAM can be described by the common aim, which is clearly identified in both approaches; i.e., both concepts are trying to solve two basic dilemmas (see Table 14), whether to:

1) own or lease the useful space for the organisation;
2) use in-house or outsourced asset management.

Table 14. General basis for the PREAM models, based on the concept of CREM.

Management (centralized, decentralized)	**Owning** (centralized, decentralized)	**Leasing** (cost-based, market-based)
In-house	1. Owned, self-managed	3. Leased, self-managed
Outsourced	2. Owned, management outsourced	4. Leased, management outsourced

Source: adapted by the author from Ilsjan 2007.

Property outsourcing has been driven by the argument that real estate and its management is not the core business of an organisation (see Figure 8 below) and is something that can be outsourced to a professional operator and converted into a more manageable cost at agreed levels of service delivery from the outsourcing company (Hynes and Nunnington 2010: 79). For example, McDonagh and Hayward (2000) define outsourcing as partial or total contracting out of a business task, function or process to an external service provider; mentioning also, that it involves replacing the internal provision of services with the external provision of those services. Since a similar definition has also been used by other scholars (see e.g., Stoy and Kytzia 2005), the author will proceed from the above definition on outsourcing real estate services in public sector organisations.

To help classify corporate real estate, Adendorff and Nkado (1996) identified two major types of real estate owned by a company, i.e., strategic property and core property. Strategic property is real estate that organisations need to own and control for carrying out its operations and long term business strategy. Examples of such properties are manufactories, plants, warehouses and so forth. Core property refers to real estate that an organisation needs in order to control its existing and (or) future operations and to carry out its medium term business strategy. Examples of such properties are commercial, industrial or retail facilities from which the company operates. (Hwa 2003: 6)

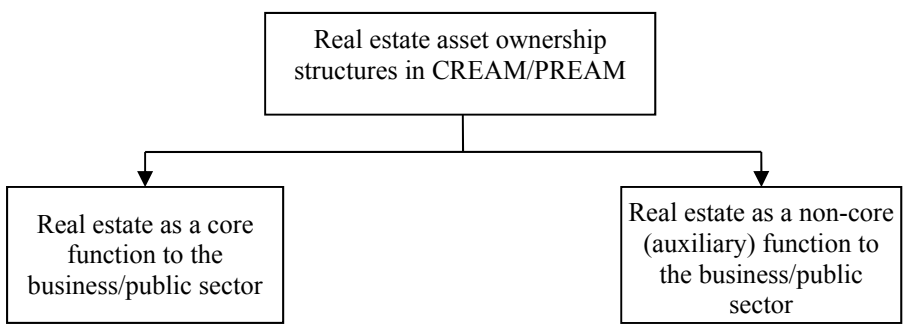

Figure 8. Definition of real estate ownership structures in CREAM) and public sector real estate asset management (PREAM). (Source: compiled by the author, based on Rogers 1999)

Both dilemmas are connected to a third problem – how to finance public sector activity concerning real estate. Meaning that the previously mentioned "owning-leasing" and "inhouse-outsource" dimensions are connected also to the financing dimension. The main possible ways for solving the financing issue are as follows; i.e., public sector real estate can be financed either through:

1) central or local government budget (i.e., tax revenues);
2) bank loan or issue of bonds;
3) private investor(s); or
4) public-private-partnership.

As it can also be seen from Figure 9, the concepts of CREAM and PREAM are similar in terms of real estate environment and management strategy. The reason stems from the understanding that the set of real estate of one country or state can be as large and important as a set of real estate of a corporation. The same applies to the way management strategy is used, i.e., by essence it should be proactive both in case of CREAM and PREAM. For that reason, it is hard to distinguish them from each other within this scheme.

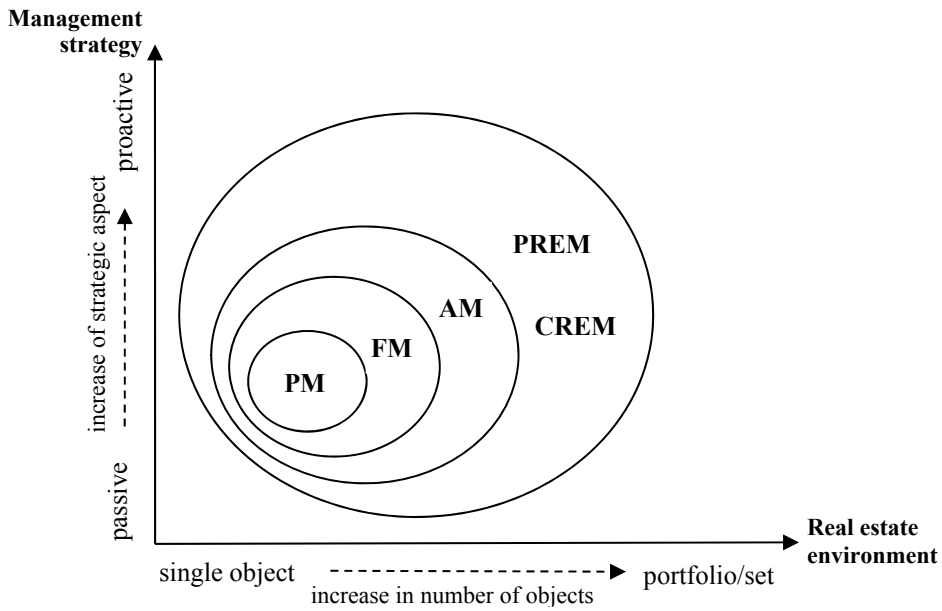

Figure 9. Conceptual change from property management concept towards CREAM and PREAM in conjunction with real estate environment and management strategy (Source: compiled by the author.)

On Figure 9, abbreviations PREM and CREM are used instead of PREAM and CREAM to denote general real estate management (REM) concepts, either public or corporate, where asset management (AM) is inherently already taken into account.

1.3. Theoretical considerations in real estate ownership and leasing in public sector

1.3.1. Basis for leasing and public sector incentives in leasing

In both public and private sector organisations, the decision on whether to own or lease assets is always crucial. In order to make decision-making in public sector organisations easier, there is a need for a thorough understanding of the basis for leasing. Also, it is necessary to investigate lease incentives for the public sector.

In general terms, leases are contracts which are freely entered into by their parties (Crosby *et al*. 2003: 1488), i.e., the owner from the one side and the occupier from the other side. Much research about leasing in the real estate market has been conducted in the UK. Although the general lease terms in the UK have been developed historically and are in many aspects very specific, the researches carried out in the field can be generalised also to other markets and situations. For example, the main target for the UK property market is to become a more flexible leasing market and provide all tenants with leases that meet their business needs (*Ibid*.), the same can be applied to governmental needs in leasing. On the other hand, Hussain (2006) argues that a lease is a derivative security, the value of which depends upon the value of the underlying asset.

According to Stanton and Wallace (2009), leases are in many ways very similar to corporate bonds – both are contracts in which one party promises to make set payments to another over some period of time. In both cases, the period of the payments may be long or short, the payments may be fixed or adjust over time according to some rule, and the contracts may or may not contain option-like features. In the case of corporate bonds, the most common options are the options to default, to call the bond (i.e., to repurchase it at some fixed price), and to convert it to a fixed share of the organisation's equity. In the case of lease contracts, there is again a default option, there may be cancellation options (effectively making the lease callable), and there are often also various equity-like features in which future payments are tied to economic variables such as sales or the growth of the consumer price index (CPI). (Stanton *et al*. 2009: 1) All of these aspects are relevant in valuing the options of owning or leasing an asset.

Although there have been many theoretical advances in lease pricing (e.g., by Miller and Upton 1976, Brennan and Kraus 1982, McConnell and Schallheim 1983, Schallheim and McConnell 1985, Grenadier 1995, and Grenadier 2005), leases have still remained relatively under-studied. There are two main reasons why leases have not received sufficient attention despite their relevance: (1) the lack of available data, (2) leases are substantially heterogeneous in their terms. (*Ibid*: 2)

In their research conducted on the basis of the UK commercial property lease market data, Crosby, Gibson and Murdoch (2003) indicated that there

exists a mismatch of lease structures on the property market. The authors revealed that the inability to manage entry and exit strategies of leases is a major concern to occupiers, i.e., leases are sticky on the UK market. The evidence gathered from the UK market suggested also that there is a gap between occupiers' lease requirements and those currently offered on the market. The data indicated that since 1990 leases in the UK have become shorter and more diverse. At that time, the average lease length of all retail, office and industrial property in the UK metropolitan areas was between 10 and 15 years, whereas standard leases of office spaces was 20–25 years with upwards-only rent reviews every five years. The latter caused a situation where during market recession periods rents were above market value, i.e., overrented. Analysis made on an international level has indicated that leases more than 10 years in length are rare and are only occur in case of the highest quality buildings let to multinational or large national corporations. (Crosby *et al*. 2003: 1487–1488; 1490) The average lengths of leases in various commercial spaces internationally vary from 5 to 10 years, being shorter for smaller retail spaces (2 to 5 years) and longer for industrial spaces (even up to 20 or 25 years).

According to Crosby *et al*. (2003: 1489), institutional lease appears to have certain characteristics which both reduce the risk of investing in property and enhance the ability of the investor to finance the purchase. Tenant covenant strength and the lease structure are top of the investors' league table of property risk issues. In terms of long unexpired lease length and the lack of options for tenant to break the lease, create a safety-net for investors against any periods of void, therefore remaining subject only to tenant default risk, which is examined by Grenadier (1996). Some of the authors (e.g., Agarwal *et al*. 2011; Ambrose and Yildirim 2008) have paid much attention to tenants' credit risk, being the subject to tenants' default risk and having a substantial impact on lease term structure. The latter is discussed in more detail in the methodological part of this paper, in sub-chapter 2.5.2.

Tenant risk can be divided into covenant risk and lease agreement risk. The credit worthiness and default risk of the tenant plays a very important role in negotiating over lease terms. Although the potential default risk of state institutions may be regarded to be quite low, there still exists some potential opportunity of default also for the state acting as a tenant. In the UK, there are constraints of risk aversion in addition to more direct institutional issues such as lending policies and underdeveloped pricing models. A Code of Practice (2002) in the UK suggests that landlords should offer a range of choice of different lease terms to tenants, but accepts that these choices must be appropriately priced. Over the past 25–30 years, a substantial number of publications on lease pricing have emerged, with the latest work grounded in real option pricing theory. (Crosby *et al*. 2003: 1490) Because of the complexity of the implementation of the real option theory on lease valuation, as known to the author of this thesis, there has been no research done on this field so far, which has applied it on public sector organisations.

Notwithstanding the developments in the theoretical basis of lease pricing, there are still several problems in practice that need to be solved. For example, the above-mentioned real estate lease pricing problem, i.e., how real estate leases should be priced, remains unsolved; as does the issue of whether variations in lease terms produce variations also in rents. In addition – as it is known, the public sector uses in-house or internal lease relatively widely, but the problem of its proper implementation is still not solved. What is more, none of the papers within the available literature and researches done so far have paid attention to the problem of inner market rent structure (market rent components) in the way it is revealed in the methodological part of this dissertation.

1.3.2. Incentives in ownership and leasing in the public sector

This subchapter elaborates on the incentives of leasing *versus* owning state real estate, and also the incentives in leasing from the best practice[12] worldwide. Discussion over lease incentives is important in order to identify the conflicts of interest between real estate owners and tenants. The main unsolved issue within the concept of PREAM is whether to lease the space, needed by government institutions for their operations, or to own the space and have it managed by the owner. Within this topic, the main questions to be answered are: what kind of incentives are there for renting a space:

1) for the state from a private investor, and
2) for a private investor to the state?

A lease incentive can actually be anything of value to the tenant, providing they are prepared to give the owner a solid and well-structured lease in exchange for occupancy of the premises. The level of incentive to be provided to a tenant depends on the market of the time, the supply and demand of available space, and the local and regional business sentiment. Incentives in the leasing of property are not free. In theory, any incentive the landlord provides to the tenant should be mortised back into the lease cash flow over the initial lease term (not the option). In this way the landlord gets back their money from the initial outlay on the incentive. The most common lease incentives, used for commercial real estate in practice, are:

- reduced rent from lease commencement to a set date during the lease;
- rent free period for a period of time in the lease of the premises;
- owner-provided fit-out in the premises;
- owner-provided cash for the tenant to apply to fit-out or move of premises;
- landlord-funded payout of a tenant's previous lease obligations.

As already previously state, in most countries, state and local (municipal) governments own and operate substantial amounts of real estate assets. Many scholars have argued that investing taxpayer capital in the ownership and

[12] The US GAO (1995) define best practice as "…processes, practices, and systems identified in public and private organisations … performed exceptionally well and … widely recognised as improving an organisation's performance and efficiency in specific areas". (Phelps 2009: 278)

operation of these assets is not necessarily important in order to provide support and services to the taxpayers, as leasing option can effectively replace the ownership option. Table 15 gives a short overview about the general advantages and disadvantages of leasing and owning asset. The content of the table can also be applied to the public sector.

Table 15. Typical lease-versus-own considerations.

	Leasing	**Ownership**
Advantages	• Generally off balance sheet recognition • Market residual risk left to developers / investors • Flexibility for expansion / extraction	• Long-term control • Facility specially designed for business needs • Provides a mechanism for financing (if needed) • Participation in upside of market risk • Flexibility in using existing space with the option to lease out surplus space (also partially, in smaller areas)
Disadvantages	• Usually the more expensive option • Loss of control • Long-term leases can affect balance sheet/financial ratios • Existing facilities may not match business needs • Less flexibility to choose the most suitable space from the market	• Illiquid and smaller flexibility to move from space to space • Balance sheet impact • Residual real estate risks borne by organisation

Source: Krzysko and Marciniak 2001: 289; Wheatherhead 1997; author's modifications.

Exploring real estate ownership internationally, Brounen and Eichholtz (2005) found that real estate ownership appears to be driven by industrial differences rather than national variations, with corporate real estate ratios ranging between 0.02 (financial sector) and 0.63 (mining). Overall, real estate ownership appears to be decreasing over time, which may be due to the gaining popularity of lease alternatives (Brounen and Eichholtz 2005: 429).

It has been argued that real estate ownership increases the exposure to real estate risk (e.g., Tuzel 2010, Fabozzi *et al*. 2010). Many of the studies have implicitly assumed that having more real estate will increase the exposure to real estate risk (e.g, Tuzel 2010, Hwa 2006, via Lee *et al*. 2012). However, some evidence on the industry level has shown that the relationship is not so linear. Real estate risk is priced through the additional risk premium, discussed in Chapter 1.4 of the dissertation. Lee and Jang (2012) found that real estate risk

exposure is conditional in nature, being time-variant and depending also on liquidity and on financial constraints.

1.3.3. Sale and leaseback transaction according to transaction cost theory

In many countries, governments have signalled a major shift in their property strategies by implementing various actions, e.g., disposing surplus assets[13] or spaces, carrying through sale and leaseback (SLB), and also series of PPP transactions. Especially in recent years, both property disposal, and sale and leaseback transactions have become one of the best ways of releasing funds, which are widely used in private sector practices by corporations, and also by many governments in several countries (e.g., Australia, New Zealand, and the UK). This means that one way to monetize the government budget is to implement it through the various sale and leaseback structures of public sector real estate.

Transaction cost theory (TCT) is widely regarded as a classic contribution to the study of organisations, economics, law, and, in particular, to sourcing decisions. TCT represents one of the few coherent bases that managers can use when they make sourcing decisions. Therefore, TCT should not be dismissed lightly.[14] (Aubert and Weber 2001: 4) In this thesis TCT is seen as the transaction of the public sector real estate assets to the private sector.

According to Lacity and Willcocks (1995), a measure of critical dimension of TCT is asset specificity. Aubert and Weber (2001) argue that there is another dimension to use as a proxy in measuring asset specificity, instead of the one proposed by Lacity and Willcocks – namely, an asset's strategic value to an organisation.

Management attitudes towards resources will change depending on the pressures they are experiencing. During tough economic times management will focus on tightening the budget for the business. The sale and leaseback option, which emerged in the 1960's, provides a financial solution to many non-investment businesses to free up the balance sheet[15] (Jefferies *et al*. 1990). Other ways of utilizing resources (partial leasing) or cutting back on resources (divestiture) have also provided reprieve in economic conditions, characterised by limited credit availability. (Simpson and McDonagh 2010: 2)

Sale and leaseback is a transaction in which a freeholder or leaseholder sells their present interest and in return takes a lease back on part or whole of the property at an open market rental or a lower rental linked to the sale price. The

[13] Those public sector assets that are no longer required for service delivery are regarded as surplus assets and are in most cases disposed of to the private sector.

[14] Theories, by definition, cannot provide perfect prediction of the phenomena that are their focus. (Aubert and Weber 2001: 4)

[15] According to Cohen (2003), approximately 75% of corporate real estate in Europe was owner-occupiers, compared to around 30% in the USA. The last decades have anticipated both in Europe and in USA a trend toward the sale and leaseback or similar transactions offered by corporations, taking the real estate off the occupier´s balance sheets. (Hill 2003: 313)

new owner acquires the property with a tenant and a guaranteed rental income, without incurring letting fees or risking a rental void. The old owner releases capital for alternative investment purposes and yet retains occupation of the property at least until the expiry of the lease. (Blackledge 2009: 59)

Grenadier (2005: 1210) announces that under a sale-leaseback agreement, the owner of a building (usually the sole occupant) sells the building and simultaneously signs a lease on the building. Thus, in result of the sale-leaseback transaction, after the selling of the asset, the owner-occupant of the commercial property retains long-term operating control through a simultaneously executed lease (Sirmans *et al*. 2010: 221). Such transactions are typically justified as a form of financing: the seller/tenant uses the sales proceeds for business expansion and the lease payments represent financing payments. Modelling the sale and leaseback transaction, as Grenadier (2005: 1210) states, is by essence quite simple. The transaction has two components: setting the sales price and setting the lease terms. If the sales price equals the true market value of the building, then the lease rate must equal the equilibrium lease rate on a standard lease. However, if the sales price differs from the market value of the asset, then the lease terms also differ from the equilibrium lease rate on a standard lease. For a transaction to occur, the benefits to the buyer must be greater than or equal to the benefits to the seller (Sirmans *et al*. 2010: 224).

There are at least two possible ways to implement the sale and leaseback transaction. Firstly, the disposition of the real estate asset and leaseback of the space can be made in one transaction, i.e., transition of ownership and the settlement of a lease contract is done within one transaction. Secondly, the transition of ownership and the settlement of a lease contract are made separately from each other. In this thesis SLB is determined as a combination of two simultaneous transactions, based on two separate contracts: sale of property to a private investor and a simultaneous contract to lease the property back. The length of the lease contract under a SLB transaction is negotiable between the contractual parties, but in case of the public sector, it is usually long-term (so-called financial lease or capital lease), i.e., from 10 to 30 years.

Sirmans' *et al*. (2010) findings based on US real estate market data from January 1993 through December 2007 reveal that transactions structured as SLB occur at significantly higher prices than market transactions. Specifically, SLB transactions sell for a premium of about 13% relative to comparable non-SLB properties. In addition, after accounting for income differentials, buyers and sellers are appropriately pricing the transactions resulting in no undue advantage to either party, that is, the expected price premium is accounted for in the SLB transaction prices.

Benefits from the SLB transaction are twofold, i.e., both for the seller and for the buyer. Assuming that the pre-transaction owner has a book value below the transaction price, noted by Sirmans *et al*. (2010: 221–222), at least five benefits accrue. Firstly, the gain realised on the transaction by the seller can be amortized in the seller's income statement thus increasing reported earnings (Moyer and Krishman 1995). The impact of earnings will improve the seller's

financial performance as the seller increases the use of off-balance-sheet financing. Secondly, the asset is removed from the seller's balance sheet potentially leading to further financial ratio improvement. If the real property is low-yielding, the disposal of low-yielding assets may also increase the return on assets (Martinez 1999, Barris 2002). Thirdly, the seller avoids debt restrictions associated with borrowing and effectively obtains favourable financing on the property. Fourthly, the seller releases capital and borrowing capacity for the use in core operations (Horn 2000, Barris 2002). Fifthly, the seller may transfer latent tax benefits to the buyer due to differentials in cost basis, remaining deprecation term, and tax rates.

The buyer also benefits from the SLB transaction, by obtaining an asset occupied by a long-term tenant. Obtaining the property and tenant simultaneously has at least three advantages. Firstly, the search costs associated with leasing the property are eliminated. Secondly, the buyer is able to evaluate the quality of the tenant before obtaining the property. Thirdly, given the typical triple-net underlying lease (tenant pays all operating costs), the purchasing company acquires an asset with characteristics very similar to a high-quality mortgage bond. Uncertainty associated with operating expenses and vacancies are muted increasing the investment value of the property to the buyer. Hence, the buyer may be acquiring an asset with superior characteristics when compared to many non-leaseback transactions. (Sirmans and Slade 2010: 222) From this it is possible to conclude that the SLB transaction of public sector real estate assets can be implemented in a way that it will end up relatively favourable to both contractual parties – for the seller and also for the buyer of the asset.

1.4. Theoretical background for discounting cash flow in the public sector

1.4.1. Overview of discounting applied in the public sector

The concept of discounting is a central theme in economics, since it allows the comparison of effects occurring at different futures times by converting each future dollar into the common currency of equivalent present dollars (Weitzman 2012: 309). By nature, discounting represents an especially acute dilemma for projects involving long time-horizons (*Ibid*.) and since the main view of the current thesis is *ex ante* in a long-term period regarding the essence of the life expectancy of real estate as an asset, then the issue of an appropriate discount rate application to the future public sector cash flow will follow.

The main problem arises from the well-recognised fact that a government should allocate its budget to maximize social welfare (Park 2012: 1). When the net present value (NPV) is used as the basis for a project or an investment choice, the discount rate critically influences budget allocation; but yet there is no consensus on the optimal discount rate that would maximize social welfare (*Ibid*.).

So far, literature on public sector discounting has brought many important insights into the topic, but still there remain wide differences on some fundamental issues (Spackman 2004: 467). The main argument in literature concerns socially sensitive domains, such as (Grenadier and Wang 2007):

1) the adequate assessment of the discount rate appropriate for government projects and investment, and
2) the question about the proper discounting method, depending on the discounting function.

The debate over the ethics of positive discounting of public sector cash flow states back to as far as the 1920s, beginning with the seminal works on the topic by Pigou (1920) and Ramsey (1928), who brought up questions about the intra- and inter-generational views on discounting. According to the normative perspective of social approach, based on Ramsey (1928), a popular argument is that "the ethical presumption that all individuals, including those living in different generations, should be valued the same." (Kohyama 2006: 33) That means the future generations ought to be given exactly the same weight as the currently living ones and therefore there should be no discounting of future relative to present utility (Marini and Scaramozzino 2000: 639). Since then, a lot of discussions have been undertaken by a number of scholars about the application of an appropriate discount rate used in the public sector for budgetary purposes, which is in depth discussed further in sub-chapter 1.4.2.

Regarding the discounting method, there are two basic views found from literature, which also correspond to the discount rate problem (Grenadier and Wang 2007):

1) exponentially discounted cash flow function, where it is assumed that the preferences are time-consistent;
2) hyperbolic and quasi-hyperbolic discount function, where the preferences are assumed to be time-inconsistent (i.e., present-based or hyperbolic preference).

The neoclassical way of thinking follows the exponential discounting path, where it is assumed that the agents have a stationary time preference and they discount the future at a constant exponential rate (Cropper and Laibson 1998). Therefore, when using exponential discounting, there is an undervaluation of distant future events due to the geometrical reduction of the function $(1 + i)^{-t}$ (Rambaud and Torrecillas 2006: 76) and the near to the present events are valued more highly.

However, there are some strong empirical evidences that people by nature are discounting hyperbolically, i.e., applying larger annual discount rates to near-term returns than to returns in the distant future (*Ibid*.), which is well observed in researches, based on animal and human behaviour. For example, Ainslie (1992) and Loewenstein and Prelec (1992) concluded that the discount functions are generalized hyperbolas, i.e., events τ periods away are discounted with factor $(1+\alpha\tau)^{-\gamma/\alpha}$, with $\alpha,\gamma > 0$. Such discount functions imply a monotonically falling discount rate, where the discount structure sets up a conflict between today´s preferences and the preferences which will be held in the

future, implying that preferences are dynamically inconsistent.[16] (Laibson 1996: 2–3) Therefore, according to hyperbolic discounting, the discount rate declines as the time-horizon increases.

Quasi-hyperbolic function in discounting was first proposed by Phelps and Pollak (1968) for intergenerational analysis and then applied by Laibson (1997) for intrapersonal analysis (Cropper and Laibson 1998: 3). What concerns the discount rate corresponding to the way of discounting, then Ramsey (1930s), Strotz (1950s) and Herrnstein (1960s) were the first scholars to understand that discount rates in the short run are higher than in the long run. Similar kind of view and arguments has been applied also in intra- and intergenerational discussions.

According to Spackman (2004), it is possible to observe several viewpoints about an appropriate discount rate applied to long-term cash flow from public sector investments, e.g.:

1) some would discount at a rate appropriate for a similar private investment;
2) others would advocate a rate reflecting the opportunity cost of displaced private sector investment;
3) some would say that the rate should instead reflect, wholly or in part, a "social time preference" rate, perhaps derived from a risk-free market rate, or perhaps from other sources; they might also say that, as well as discounting, the impact of public spending on private sector activity should be reflected by applying shadow prices;
4) some would say that, although public sector rates differ from those appropriate to the private sector, they too should vary with the type of investment.

All in all, the public sector faces investment decisions as commonly as the private, whereas previous research and methodologies have mostly been focused on the private sector (either companies or individuals). At the same time, cost of capital on the government level has remarkable importance not only from the theoretical viewpoint, but also because of its important practical implications in guaranteeing the most efficient allocation of public resources in the long run. Several studies have considered the discount rate of Estonian companies (e.g., Sander 2003, Jegorov 2010), but literature lacks thorough theoretical considerations from the viewpoint of the Estonian government (Sander *et al*. 2011). One of the other topics not covered in publications, is the difference in discounting and discount rates in case of different situations concerning decisions over real estate. Therefore, in terms of public sector real estate and its management models, there is a remarkable gap in the literature, which should be fulfilled.

One of the focuses in this dissertation is on determining the most appropriate long term[17] discount rate for government projects, based on government

[16] For example, from today's perspective, the discount rate between two far off periods, t and t+1, is a long-term low discount rate. However, from time t perspective, the discount rate between t and t+1 is a short-term high discount rate. (Laibson 1996: 3)

financing, on the example of a set of state real estate[18]. Without necessary discussion, policies concerning government real estate can result in additional costs or smaller revenue receipts for the state budget, decreasing through that welfare.

1.4.2. Basis for discounting in the public sector

In governmental long-term investments projects, the standard use of the cost-benefit analysis based on exponential discounting and a constant discount rate has been criticized, when used to appraise the cash flow. The critiques are motivated by the scarce importance this model attaches to the consequences of a certain project in the distant future and so to future generations. (Rambaud and Torrecillas 2006: 75)

In order to compare cash flow streams occurring at different time periods and/or cash flow streams with different risk levels, discount rate derived from the concept of time value of money is used. It is a well-known fact that so far no uniform approach for the assessment of discount rate for private companies has been developed. Therefore, the discrepancies in the approaches of different scholars for government project discount rate valuation are even higher. Most commonly two approaches are brought out for government projects: social opportunity cost (SOC) and social rate of time preference (SRTP).

For social opportunity cost the assumption is that discount rate applied on government level should not differ from the discount rate that would be used by private investors for the same project. This has been explained by the idea that risk level of cash flow is not dependent on whether the owner is a public or a private investor (Hirshleifer 1966, Baumol 1968), and also with the idea that in case of government projects final investors are still individuals (Arrow and Lind 1970). This approach has been suggested in case of projects, for which the project executor can be a public or a private investor (Young 2002). The approach is also suitable for deciding in which way it would be optimal to offer a product or a service (*Ibid.*). Some scholars (e.g., Arrow and Lind 1970) have noted that government projects carry lower risk, as risks have been divided between all members of the society. This implies to the necessity to use lower required rate of return in case of government investments compared to private investments.

The other possibility would be to use social rate of time preference as a discount rate. On the individual level, rate of time preference is the rate of return, after obtaining which consumers are ready to exchange their present consumption against future consumption. Scholars believe that in case of government investments, social rate of time preference should be used instead of

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[17] Real estate as an asset has a long life cycle, so it is reasonable and justified to calculate the long-term discount rate. Additionally, different variables used for calculations can have extreme values in short run (for instance because of economic crisis or boom), which will result in false conclusions in the long run.

[18] Results are applicable for all cases – property owned, sold or purchased.

individual rate of time preference (Kohyama 2006). Social rate of time preference can be either higher or lower than individual rate of time preference. Unfortunately, social rate of time preference cannot be directly monitored on the market. According to theory, the standard formula for determining social discount rate (SDR) based on SRTP is given by the Ramsey equation and it should be composed of two parts, seen in Formula 1 (Ramsey 1928; OXERA 2002: 14; Young 2002: 7; Spackman 2002; the Green Book 2011):

$$(1)\quad r = SRTP = \rho + \mu \cdot g_t ,$$

where r is the market rate of interest, ρ is the sum of catastrophe risk (L) and the "utility discount rate" or the pure rate of pure time preference (δ), μ is the elasticity of the marginal utility of consumption or "the coefficient of relative risk aversion" and g_t is the growth rate of per-capita consumption between now and time t (also considered as the per capita rate of growth of income).

The Ramsey equation is derived within a deterministic framework without the consideration of project or macroeconomic risk. Therefore, it has been shown how this equation can be augmented to account for the uncertainty of overall consumption growth. The idea of an augmented Ramsay equation has been given by Gollier (2008). Still, even the augmented Ramsey equation does not, as the capital asset pricing model (CAPM) does, take into account the systematic project risk. On the other hand, Weitzman (2012) and also Hagen *et al*. (2012) have suggested a way to close the gap between the consumption-based CAPM (C-CAPM) and the Ramsey rule. (Hultkranz, Krüger and Mantalos 2012: 2)

By Arrow *et al*. (2012), there were many experts involved in a discussion board held in 2012 regarding the Ramsey approach to discounting, which underlies the theory of cost-benefit analysis, as a normative approach. The approach implies that its parameters should reflect, how the society values consumption by individuals at different points in time; i.e., that δ and μ should reflect social values. The question is how these values should be measured. (Arrow *et al*. 2012: 11) The consumption-based CAPM therefore extends the CAPM by focusing on the correlation between the yield from a specific asset and overall economic activity (consumption) (Hultkranz, Krüger and Mantalos 2012: 6).

1.4.3. Estimating the opportunity cost for public sector budgetary purposes

According to Kohyama (2006), it is possible to look at discount rates from two viewpoints: from the viewpoint of government (financial approach) and from the viewpoint of the society (social approach). In Figure 10, the two viewpoints are elaborated further to describe them in the context of the measurement part of the discount rates according to theory and also according to practice.

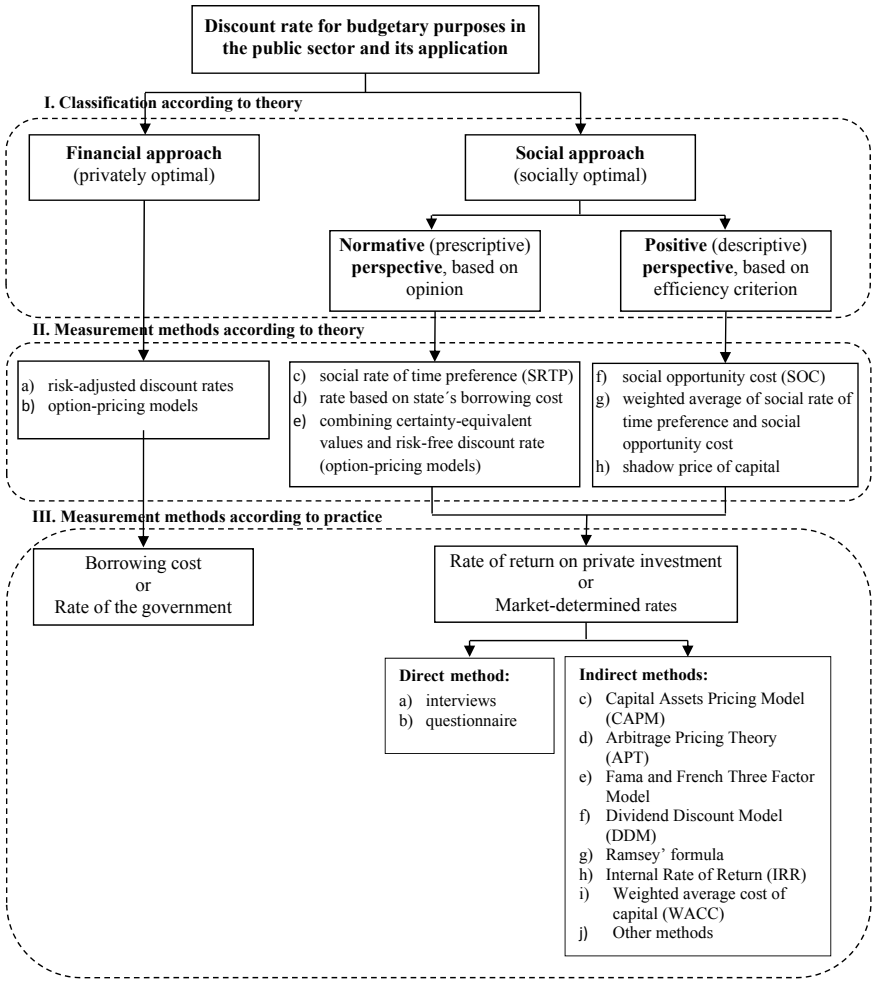


Figure 10. The classification and measurement methods of discount rates, according to theory and practice (Source: elaborated by the author, based on the literature and Kask 2014: 116.)

SRTP is a discount rate, reflecting the change in the value of the consumption in different time periods. Principally, it can be viewed as the return to capital savers. SOC, on the other hand, is a discount rate that an investor would expect from different opportunities that have equal risk. In other words, it is the return to capital investors and is used in cases the investment represents value for money. SOC also reflects cost in financial market terms, a government takes into account "similar" projects' return from private investment. As the social rate of time preference is not observable on the market and hard to implement indirectly in practice, SOC of capital is often used as a proxy to SRTP. It is

possible, as both approaches contain the elements of opportunity cost underlying them. (Young 2002)

There are two ways, how the calculation of the social approach of discount rate is applied in practice – direct or indirect. In case of the direct method, the required rate of return value will be given by investors. The problem with the direct method is that different investors have varying return expectations and levels of risk aversion. When the investor is a government, an additional problem is that all tax payers can be seen as (final) investors. Officials responsible for investment decisions are only the representatives of tax payers. In theory the concept of marginal investors' required rate of return has been used (Damodaran 2010: 71), but still it is not clear, who should be that hypothetical marginal investor. Therefore, the indirect method would be a better way for assessing the level of an appropriate discount rate.

In case of indirect methods the discount rate is calculated using current or historic data. The major difficulty at that is that the actual required rate of return cannot be observed from market data and therefore scholars can calculate different rates of return. One of the best-known methods for calculating the required rate of return is the capital asset pricing model (CAPM), formulated by Sharpe (1964), Treynor (1961)[19], Lintner (1965) and Mossin (1966). It is an equilibrium model based on Markowitz's portfolio theory; Tobin's separation theorem, and a number of restricting presumptions (see e.g., Sander 2003). Although many of those presumptions are not fulfilled in practice, CAPM has developed to be one of the most utilized methods in the world for discount rate calculation (Bruner *et al*. 1998; Pereiro 2002). Arbitrage pricing theory (APT), which has less restricting presumptions compared to CAPM, was formulated in 1976 by Ross. But still the practical application of the model is much more difficult, as APT does not list the factors influencing required rate of return and scholars have to create the model based on empirical data. In case of Fama-French three factor model, discount rate is beside systematic risk (used in CAPM) dependent on company size and the ratio of company book and market value (Fama and French 1992). Dividend discount model allows assessing discount rate reflected in the market price of the asset in case the expected dividends and their growth rate are known (see e.g., Vernimmen *et al.* 2005: 434). There are other methods for discount rate calculation, whereas specific models have been created for the real estate market (see e.g., D'Argensio and Laurin 2008). Still it can be concluded that CAPM has been the most widely used by practitioners because of its simplicity.

[19] The Treynor manuscript, where the results were achieved, has not been published.

1.5. International experience in PREAM

1.5.1. Principles of public sector real estate asset classification

For successful management of public sector property, it is essential to make some generalizations about the classification of state real estate assets within their set. In almost every country certain rules for the classification of public sector real estate assets have been established on the governmental level. In general, asset classification can be implemented either by its owner, user or function.

The most clearly defined identification has been formulated by the government of the US, where all state real estate should be reviewed and classified as either core or non-core real estate (Hentschel and Utter 2006: 184). Accordingly, core assets are those that are essential to accomplish the government's service delivery mission. Core properties are primarily used to accomplish the operational or service delivery function and the objectives of the government, including the following two broad categories (*Ibid*.):

1) government-use properties (e.g., office, warehouse, police station, firehouse);
2) social-use properties (e.g., school buildings, health service facilities, parks and recreation facilities, public housing).

Non-core assets are sites and buildings, including the property rights under, over, and around them, that are supplementary or complementary to the government's service delivery mission. Non-core assets can include former core assets that have been surplus or underutilized and are considered to be excess to the government's mission. (*Ibid*.)

In many cases, the data collection, performance measurement and portfolio analysis method depends on the classification of the assets. According to the experience of the US government, the performance of core assets is typically calculated as a function of utilization. For example, operating costs or utilization can be evaluated on a unit basis, such as per square meter, per employee, or per person served. Comparative standards can be compiled using historical data collected over time. In the absence of such data, published standards of private-sector property performance (e.g., office, warehouse, or retail properties) or obtained from other government units can be useful surrogates. On the other hand, gauging performance of non-core assets is typically measured as a function of productive opportunity, such as revenue to be realised, number of jobs to be created, increase in tax base to be realised, extent of revitalization to be achieved, etc. While objectives and performance measures rarely change for core assets, those of non-core assets will vary with economic and political priorities. (Hentschel and Utter 2006: 185)

Although the majority of countries use either a clear classification or at least some sort of semi-classification of their state real estate assets, in some countries, like Australia, any asset classification is used on the state level. On the other hand, in Sweden and in Finland, public sector real estate assets are classified in two categories: as special-purpose properties (SPP) or special-purpose buildings (i.e., equivalent to "core assets" in the US) and general-purpose pro-

perties (GPP) or general-purpose buildings (i.e., equivalent to "non-core assets" in the US). General-purpose property would be regarded as generic spaces.

From the CRE perspective, to assist in the classifications, Adendorff and Nkado (1996) identified two major types of real estate owned by a company, which are strategic property and core property. Strategic property is real estate that corporations need to own and control for their operations and long-term business strategy. Examples of such properties are manufacturing plants and warehouses. Core property refers to real estate that a corporation needs to control its existing and or future operations and for medium term business strategy. Examples of such properties are commercial, industrial or retail facilities from which the company operates. (Hwa 2003: 6)

As Fernholz *et al*. (2007) indicate, then, on the basis of various real property records, it is possible to put assets into three main groups: buildings, infrastructure and land. Buildings can be for administrative use, service provision (e.g., schools), rental, and in some cases, for housing. Infrastructure assets usually include power distribution stations, transmission towers, water distribution systems, roads and bridges. Land holdings are assets that could be in permanent or temporary use, such as parking areas, parks and environmental assets. (Fernholz and Fernholz 2007)

Another possibility to classify the set of public sector property is proposed by Utter (1989), called the Denver model[20], which categorizes the set of government assets by their use into three types – i.e., those required for mandatory functions (governmental), those required for discretionary functions (social), and surplus assets; with specifying the differing financial goals and information needed for each category, as shown in Table 16. The model was created as a robust framework for use in local governments (Phelps 2009: 26).

Table 16. The modified Denver model for the classification of public sector real estate holdings.

Category /Asset use	Financial goals	Types of real estate	Financial information needs
Group A: Core properties (governmental, used for mandatory functions)	Increase efficiency and minimize costs (while maintaining acceptable quality).	City hall, fire or police stations, water supply facilities, cemeteries, etc.	Expenses, internal rent, value-in-use.
Group B: Additional properties (social, used for discretional functions)	Quantify and minimize the property-related subsidy.	Housing, parks, some cultural facilities, office spaces for NGOs, etc.	Quantify and minimize the property-related subsidy.
Group C: Surplus property	Maximize financial returns.	Investment property, remnants from various sources.	Expenses, revenues, market value.

Source: Kaganova and Underland 2006: 300; Kaganova, Nayyar-Stone and Peterson 2000: 4; adapted from Utter 1989.

[20] The model was developed by the city administration in Denver, Colorado.

Classification helps to defuse confrontation over specific decision on an asset because it focuses on property and not on the merits of a particular user. Therefore, establishing the sets of public sector real estate, based on a particular classification model, helps governments make decisions about properties on a more rational basis. (Kaganova and Underland 2006: 300) In general, in various countries public sector real estate assets classification has been implemented either according to its owner, user or function. In summarizing the above, asset classification is important because it enables to (Rymarzak and Trojanowski 2012):

- clarify and separate strategically important real estate assets for the state;
- differentiate the management methods applied to different real estate assets in order to achieve financial goals.

Based on the interviews conducted in October 2010 among the representatives of Estonian ministries responsible for the management of their sets of buildings, the author has compiled a table (see Table 17) to give a summarised overview of the possible parameters for the classification of public sector real estate assets. The base materials for the semi-structured interviews conducted in 11 ministries have been described in Appendix 1.

Table 17. The essential classification parameters of general-purpose property (GPP) and special-purpose property (SPP) in Estonia.

		GPP	SPP
1.	Concept/definition	State building assets, which have an alternative market offering during a reasonable time-period, taking also into account (including) the adjustments necessary for the retrofit of the asset.	State building assets, which are created taking into account the specific needs of the user and which do not have any alternative market offering during a reasonable time-period.
2.	Essential criteria for the user	Flexibility and discretion	Stability and confidence
3.	Value maximization	Through market competition among service providers.	Through efficient cost management during the building life cycle.
4.	Classification in financial accounting	Operating lease contract (capital lease according to the potential changes in IFRS *Lease accounting* standards)	Capital lease contract
5.	Formation of rental payment	Market-based rent	Cost-based rent
6.	From the economic aspect	Disposable	Disposable if needed

		GPP	SPP
7.	From the management of the set of real estate point of view	Core asset	Non-core (strategic) asset
8.	Essential risks for the user	Risks, that restrain the possibilities of the user to choose and get the best environmental real estate solutions, including the dates, possibility to change the space, decrease the usable space, if needed, including service and management costs.	Risks associated with the owners' position of strength, including the termination of the contract, lack of information, inflexibility.

Source: compiled by the author (based on literature, conducted interviews and Estonian state government documents).

The table addresses also to the definition of special-purpose property as given in Estonian legislation (State Assets Act subsection 91 (2)), which says that special-purpose property is a built property, which is created according to the special needs of the user and in which there is lacking the supply in the market during reasonable time. In some ways, it can be seen as a universal approach to the identification of special-purpose property from the general-purpose property, being applicable also in other countries.

1.5.2. Explicit strategy in public sector real estate ownership

The following sub-chapter summarises public sector real estate assets ownership practice of several countries. The data is gathered via academic literature and the guidelines of the countries' best practice. The ownership strategies implemented by governments in Scandinavia, Australia, New Zealand, USA, Canada, and UK, is described in Table 18. The total number of country-cases used in the identification of the ownership strategy of public sector real estate assets was 12.

Table 18. Synthesis of applied or proposed models of public sector real estate ownership.

Study	Country	Asset ownership models							
		state		state-mediated		private		PPP	
		CE	DCE	CE	DCE	CE	DCE	CE	DCE
		applied to...							
Promberger *et al*. (2004)	Austria	–	–	+ - schools and universities (55%) and other administrative buildings (45%)	–	–	–	–	–
Schulte and Ecke (2006)	Germany	–	–	–	–	+ - schools and kindergartens, based on long-term lease agreement	+	+	+
Lind and Lindqvist (2005), Lindquist and Lind (2004)	Sweden	–	+ - SPP	+ - GPP	+ - SPP	+	+	–	–
Conway (2006), Conway *et al*. (2006), Warren (2002)	Australia	–	–	–	–	+ - all assets, except military and defence	+	–	–
Dow *et al*. (2006), Conway *et al*. (2006)	New Zealand	–	–	–	+	+	+	–	–
McKellar (2006a, 2006b), Conway *et al*. (2006)	Canada	+	+	–	–	–	–	–	–
Lu and Wang (2010), Grubišić *et al.* (2009a)	China	+	–	–	–	–	–	–	–
Grubišić *et al.* (2009a)	Croatia	+	+	–	–	–	–	–	–

Summary of identified phenomenon		3	3	2	2	4	4	1	1
Synthesis of used management models in this thesis...	...to set of Estonian state buildings	state		state-mediated		private		–	
		–	+	+	–	+	+	–	–
		applied to...							
		GPP, SPP		GPP, SPP		GPP		–	

CE – centralized ownership; DCE – decentralized ownership; PPP – public-private partnership; GPP – general purpose property; SPP – special purpose property; "+" – the phenomenon is existing; "–" – the phenomenon is non-existing.

Source: compiled by the author.

The Australian National Audit Office (ANAO) presented a review of their asset management audit outcome in 1995, "Audit Report No. 27, 1995–96, Asset Management". Following the release of the ANAO audit, the government of Australia adopted a "whole-of-government" property management strategy. Under this strategy, the government should own property only where the long-term yield rate or the rate of return of the real estate object exceeds the social opportunity cost of capital (OCC)[21], or where it is otherwise in the public interest to do so, and all property decisions are to conform to the Commonwealth property principles. (Conway 2006: 29–30) Those principles were applied to a whole set of public sector real estate assets, including the property of the Department of Defence. (Conway *et al*. 2006: 138) The result of the reform described by Warren (2002) stated that while in 1976 the Australian government directly owned and managed 51% of the office space it occupied, by 1996 this had fallen to 34%. The most dramatic change occurred however post 1996 when the level of owner-occupied office space fell to virtually zero.

1.5.3. Explicit strategy in public sector real estate asset management

The following sub-chapter gives a description of public sector real estate management strategies by governments in Scandinavia, Australia, New Zealand, USA, UK and others. Table 19 summarises the possible solutions of the best practices or the proposed solutions of PREAM in different countries, based on available academic literature on the topic. Due to the lack of resources (both time and money) it was not possible for the author of the thesis to carry out fieldwork in other countries in order to investigate all the possible solutions in practice. Instead, it was assumed that academic literature is a sufficiently

[21] In 2005–2006, the opportunity cost of capital was set at 11%, based on an opinion of the consultative process by the Australian Department of Finance and Administration. (Conway 2006: 31)

adequate source of information in gathering the data needed for the present research.

The results were bundled together and propositions were constructed about possible asset management models for further analysis. The total number of country-cases used in the identification of a management strategy for public sector real estate assets was nine.

Table 19. Synthesis of applied or proposed models of public sector real estate asset management (PREAM).

Study	Country	Asset management models							
		state		state-mediated		private		PPP	
		CE	DCE	CE	DCE	CE	DCE	CE	DCE
		applied to...							
Promberger *et al*. (2004)	Austria	–	–	+	–	–	–	–	–
				- schools and universities (55%) and other administrative buildings (45%)					
Holberton (2012), Schulte and Ecke (2006)	Germany	–	–	+	–	+	+	+	+
				- residential, office, commercial, service properties		- schools and kindergartens, based on long-term lease agreement			
Holberton (2012), White (2011), Dent (2002)	UK	–	–	–	–	+*	–	–	–
						- manage (and selectively dispose of) surplus Department of Health assets			
Lind and Lindqvist (2005), Lindqvist and Lind (2004)	Sweden	–	–	–	–	+	–	–	–

Study	Country	Asset management models							
		state		state-mediated		private		PPP	
		CE	DCE	CE	DCE	CE	DCE	CE	DCE
		applied to...							
Conway (2006), Conway *et al*. (2006), Warren (2002)	Australia	–	–	–	–	+ - all assets, except military and defence	+	–	–
Dow *et al*. (2006), Conway *et al*. (2006)	New Zealand	–	–	–	+	+	+	–	–
McKellar (2006a, 2006b), Conway *et al*. (2006)	Canada	+	+	–	–	–	–	–	–
Lu and Wang (2010), Grubišić *et al.* (2009a)	China	+	+	–	–	–	–	–	–
Grubišić *et al.* (2009a)	Croatia	–	+	–	–	–	–	–	–
Summary of identified phenomenon		**2**	**3**	**2**	**1**	**5**	**3**	**1**	**1**
Synthesis of used management models in present thesis...	**...to set of Estonian state buildings**	**state**		**state-mediated**		**private**		–	
		–	**+**	**+**	**–**	**+**	**+**	**–**	**–**
		applied to...							
		GPP, SPP		**GPP, SPP**		**GPP only**		**–**	

***** – planned action, CE – centralized management; DCE – decentralized management; PPP – public-private partnership; GPP – general-purpose property; SPP – special-purpose property; "+" – the phenomenon is existing; "–" – the phenomenon is non-existing.

Source: compiled by the author.

One of the possible PREAM models is also the so-called private-public-partnership (PPP) model. In this thesis, this type of model is dropped and ignored as its main application is usually in infrastructure projects, which is not in line with the topic of this research. Also, through that some additional problems that could emerge when wording a generalised description to the overall PPP model can be avoided.

1.5.4. Public sector surplus property management options

One of the crucial aspects in PREAM is the strategic management of surplus property. Surplus properties are properties that are not needed for performing either the core functions of the government or functions and activities supported by the government because of the properties' significance to social policies. Under rational asset management, surplus properties should be either disposed of or converted to investment (i.e., income-producing) properties. (Kaganova 2006: 285) The amount of space disposed of is directly derived from the normative amount of space per administrative worker within the institution, leading to activities concerning space optimization.

The aim of space optimization is to use and manage the space with lower cost, without experiencing a loss in public sector administrative functioning. According to Cock and French (2001: 272), by eliminating surplus space, an organisation's overall cost of occupation will decrease (and may release capital if the surplus space is disposed on the open market) and this will directly lead to higher profits. The described principle has been taken over in and applied to public sector real estate management. By now, it has lead to the implementation of space optimization by selling surplus space to the private sector. The other way to solve the surplus space issue is to sell the entire unsuitable building (e.g., a building with lots of unused lobby-hall space) to the private sector and to build another one, with optimized and more appropriate space usage. In either case, the optimization of space usage should finally, in the long-term, have a positive effect on the state budget and also on the government sector account.

Surplus property can fall into two main categories, either planned or unplanned. The first category usually arises through the changing needs and methods of service delivery, legislative changes, ageing and deterioration. On the other hand, unplanned relates to more external factors, such as social and economic decline and market shifts. (Avis and Dent 2004: 307)

There are two main elements to consider in relation to the strategic management of surplus property (*Ibid.*):

1) the process by which the property is identified and declared "surplus";
2) the procedure for managing surplus property effectively until the possible disposal of the asset.

Figure 11 shows the possibilities of asset utilization in connection with its internal value or taking that into account in a three-dimensional matrix. As it is seen from the Figure 11, the lower the internal utilization value of the asset to the organisation, the more probable it is that the best choice is to sell the asset, or from the public sector point of view – to weigh its privatization options. Also, vice versa, the higher the internal value and asset utilization effectiveness, the wiser it is to own and use the asset by state itself.

As stated by Kaganova (2008), the term "privatization" involves two separate initiatives:

1) asset disposition or disposal of assets to the private sector; and
2) private asset management.

Asset disposal is the identification and the disposal of assets, which are not needed any more for the implementation of government programmes and functions (i.e., surplus property); private asset management is the engagement of the private sector in managing government-owned assets, where cost savings and efficiency in the delivery of services by the private sector are clearly demonstrated. (Kaganova 2008: 8) In general, privatization can take many forms, from PPP to SLB arrangements. (Kaganova, McKellar and Peterson 2006: 19)

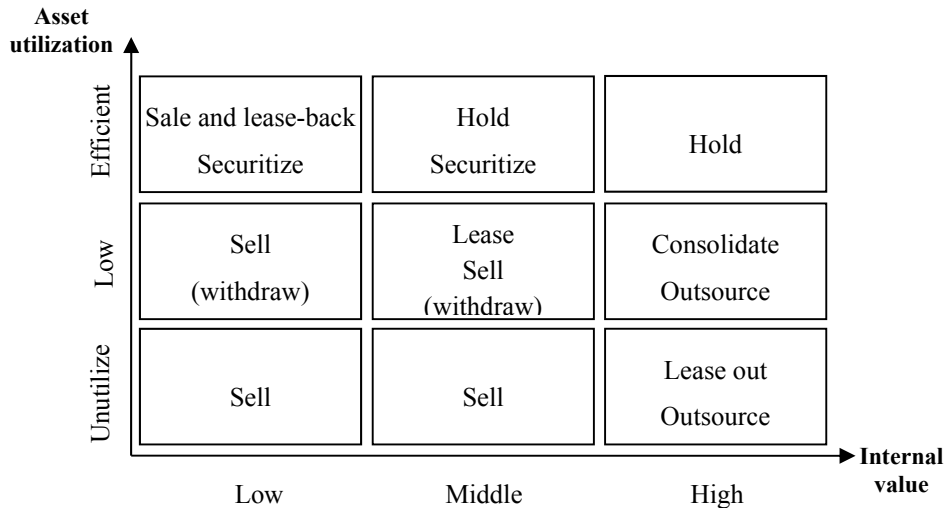


Figure 11. Matrix of real estate management options' analysis applied to the public sector (Source: compiled by the author, adapted from Oi 2010: 17.)

1.6. Proposed conceptual framework of PREAM

The following sub-chapter outlines the concept of PREAM originating from the previously described theories, which are tied to the research topic from different angles, in order to outline a solid theoretical basis for this study.

The main subject of the current dissertation is PREAM, from where more precise and challenging issues arise. The topicality of PREAM has emerged world-wide only a few years ago, although some implications of the relevance of PREAM issues have been identified in some developed countries – e.g., UK, USA, and to some extent also in Sweden – already in the early 1980s. However, most of the development of research in PREAM has taken place only from the beginning of 1990s onwards, after a global recession on the real estate market, alongside with the emergence of the topicality of New Public Administration, both in theory and practice. Therefore, because of the relatively short history of the dedication, there is a high potential for uncovered areas to research in the field.

A brief review of the historical development of public sector asset management in the UK has been given by White (2011), who outlines the cyclicality in

relevance of the topic over the 30 years and reveals unsolved issues dating back to the 1980s. White pointed out that, "Strategists should be aware that some asset management issues identified in the 1980s remain unsolved and are still evident today". Another view to the topic has been given by Kaganova *et al*. (2006), who have studied the general situation of state and municipal real estate asset management from different angles both in developed and post-soviet countries during the last decades. These and other similar kinds of researches (e.g., Grubišić 2009a and 2009b) are important for the understanding of basic issues that have emerged during the last decades. The main issues that remain unsolved, both in developed and less developed countries, stretched by the authors are the following:

1) economic inefficiency associated with the use of public sector real property (e.g., Kaganova *et al*. 2006);
2) degree of separation of public sector real estate ownership from management (Kaganova *et al*. 2006);
3) relationship between accounting reform and asset management reform (e.g., Lu and Wang 2010; Ball *et al*. 1999);
4) lack of transparency and reliable financial information systems (e.g., Bond and Dent 1998; Kaganova *et al*. 2006; Hentschel and Utter 2006; Grubišić 2009b),
5) concern about the possibility of corruption among public authorities in dealing with public sector real estate ownership and management issues (e.g., Grubišić 2009b).

So far, the author of this thesis has not discovered any one eligible approach to form the theoretical framework for explaining the PREAM phenomena on. Some attempts have been made to develop a multidimensional approach to study the problems concerning PREAM. Therefore, to obtain a better understanding and explain (methodologically) the essence of the above discussed deficiencies, a thorough investigation of theoretical foundations is needed. As PREAM is a complex and academically still developing discipline, it is difficult to resort to one particular theoretical basis to hold on to. Therefore, the author has developed a compounded interdisciplinary view to explain the basis of the theoretical concept of PREAM.

From a broader perspective, the concept of PREAM can be viewed as the amalgamation of public administration theory and finance theory. Further in this thesis, theories related to the general understanding of PREAM can be classified either as directly or indirectly related. From that point of view, these theories whose conceptual sources can be treated as potentially (empirically) measurable (in the context of this thesis), are classified as directly related to PREAM and theories with immeasurable conceptual sources, are classified as indirectly related to PREAM. Figure 12 is drawn up to give a more precise explanation to the above described understanding.

As Conway (2006) argues, asset management has in large part been cascaded down by central government policy to local government as part of these broader NPM reform processes. Public administration theory deals with

the substance of public organisational behaviour, public management, and public policy implementation. It is often characterised as a fragmented field – one that is pulled in competing directions by different intellectual and disciplinary perspectives, as well as by the concerns of practice and theory. Nevertheless, it does have a common core of knowledge and coherent intellecttual history. The practical fields of public administration deal, for example, with state budgeting and fiscal decentralization, both topical issues also in the context of the current thesis. Finance theory, on the other hand, mostly deals with private sector issues, although some of its concepts are applicable also to the public sector.

As stated by Ilsjan (2007), then until the 1990s, the property management was regarded as a technical discipline, related mostly to architecture, construction and maintenance. A survey conducted in 2007 among Estonian companies (both public and private) showed that a majority of Estonian organisations considered real estate mainly an operational asset, financial asset perspective was not discovered yet (Ilsjan 2007: 257). In addition, at that time, ownership was regarded to be an obvious choice without consideration of alternatives (Ilsjan 2007). However, by now, strong trends towards leasing have emerged. One of the important indicators reflecting an organisation's concerns on real estate within the organisation was the implementation of internal rent (*Ibid*.).

Real estate can be seen from the perspective of an operational or functional, physical or financial asset (see Figure 12). As there is an obvious gap both in literature and in real estate practice, the author has limited the topic to the financial aspects, whereas a variety of implications have been drawn from different kinds of property perspectives.

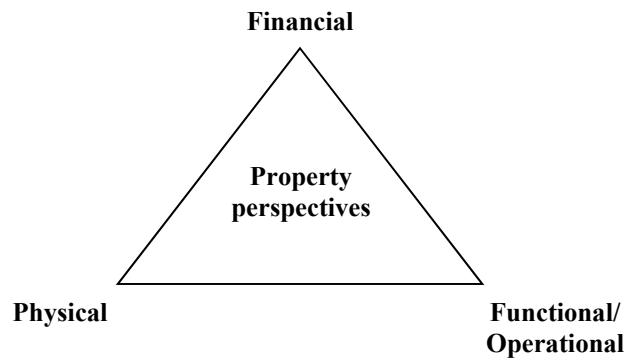
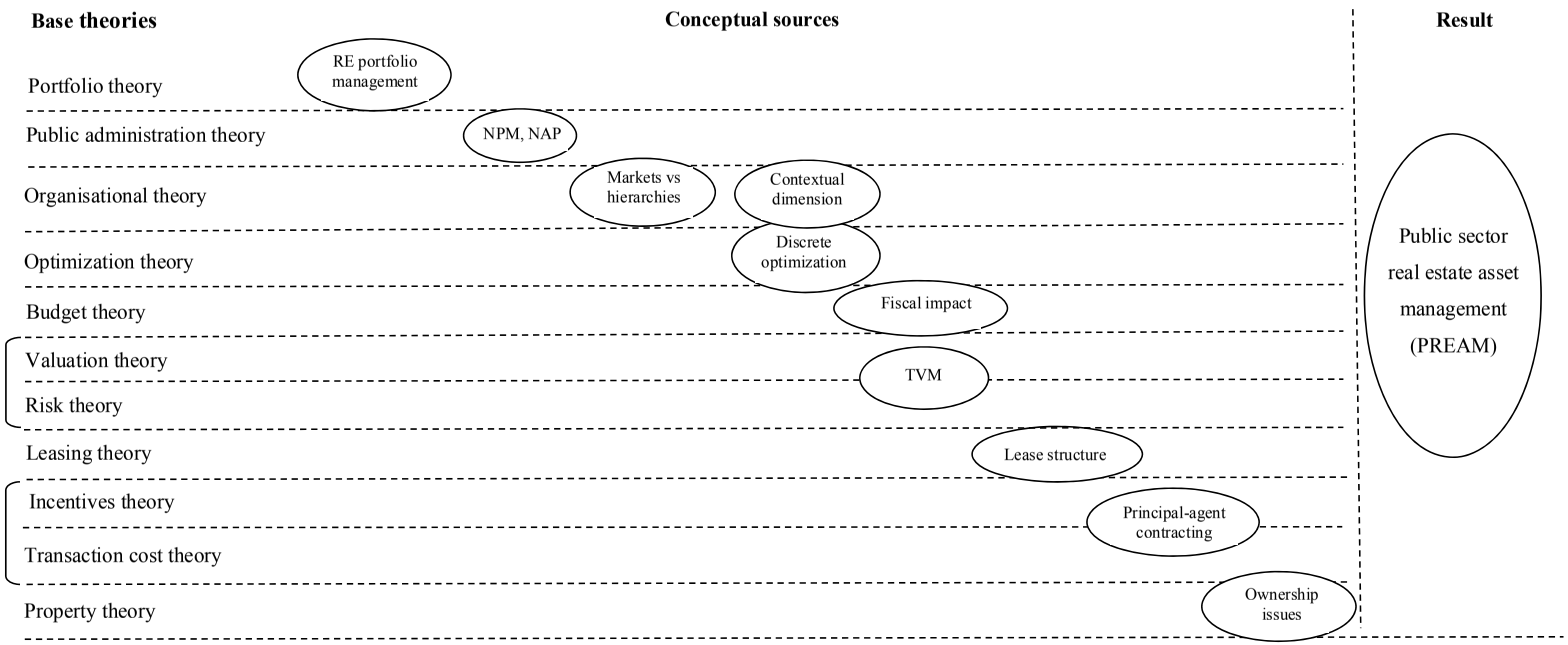


Figure 12. Variety of overlapping property perspectives (Source: adapted from Phelps 2010: 158–159, compiled by the author.)

Figure 13 gives a holistic view to the theories directly related to the measurements used within the empirical study of the thesis, i.e., the following figure illustrates the connection between theories, their concepts and their characteristics used for the measurement of relevant data within this research. Altogether they form the conceptual framework for explaining the PREAM phenomena.



Note: RE – real estate; NPM – New Public Management; NAP – New Accounting Principles; TVM – time value of money.

Figure 13. Conceptual framework for public sector real estate asset management (PREAM) (Source: compiled by the author.)

Figure 13 emphasizes the extreme complexity of the PREAM topic. Each of the theories and their conceptual sources, named on Figure 13, is carried within the main characteristics of PREAM, which are important for the measurement of its efficiency. From the author's point of view, PREAM is still a concept in its development phase. Therefore, in Figure 13, there is a plurality of theories brought out in order to show the formation of the theoretical basis of PREAM.

Table 20. Proposition 1 and corresponding outcomes.

Proposition	Outcome
***Proposition 1**: The concept of public sector real estate asset management follows the conceptual framework of corporate real estate asset management.*	In theory, the management of public sector real estate assets incorporates the same disciplines as corporate real estate asset management, but there are some essential differences in handling them. The similarity is clearly seen in the dimensions of management strategy and the environment, where the real estate assets are managed. However, the main difference comes from the institutional level of the public sector, where broader focus to achieve both public and political goals has to be taken into account.
RQ.1: Which theories form the basis for the research of public sector real estate asset management?	
The current thesis makes the first attempt to contribute to the formation of a holistic view of the theoretical concept of PREAM. Although the core of the theoretical concept of PREAM is formed by corporate real estate asset management, which is a similar kind of a discipline, acknowledged in the private sector, there are some theoretical issues that make the topicality more complex in the public sector.	
As PREAM involves manifold issues, the author has detected ties to various disciplines, including public sector administration, accounting and finance, but also corporate finance. The main theories forming the conceptual basis for the study of PREAM are public sector finance theory, organisational theory, valuation theory, optimization theory, incentives theory, property theory, and budget theory, where each of the named provides the theoretical framework of PREAM with its own conceptual sources, as outlined on Figure 13.	

Source: compiled by the author.

At present, from the theoretical point of view, PREAM is based more on the description of different kinds of practical cases than on an universal applicable theory. Still, the first movements towards the formation of a basis of PREAM theory started in the UK in the early 1980s when reports and research papers about the different aspects of public estate were published. At that time, the private sector did not have any interest towards the efficient management of assets. Parts of the public sector continued to show leadership in asset management, which continued until the early 1990s, when financial constraints began to force the private sector to take a more structured and efficient approach to managing operational real estate assets. (White 2011: 7) However,

nowadays most of the knowledge applied to PREAM stems primarily from the CREM concept and the practice that emerged to the domain from early 1990s onwards (*Ibid*.).

Summarising the discussion over the theoretical concept of PREAM, the previously set research question and proposition are answered in Table 20. The outcome of proposition 1 allows answering research question 1.

2. CONSTRUCTION OF MODELS AND THEIR EVALUATION METHODOLOGY

2.1. Construction of PREAM models

This sub-chapter of the paper aims to construct a basis for the methodology of evaluating the different ways and forms of public sector real estate asset management (PREAM). Those differences in management can be generally expressed as the PREAM models, which, in fact, are the generalization of a bundle of qualitative descriptive features of asset management. The most important features or parameters describing the PREAM models in general are – ownership, management and financing; i.e., the description of the ways how public sector real estate assets are owned, managed and financed.

One of the NPM principles is the implementation of market efficiency principles and good governance practice in general government activities (Grubišić *et al*. 2009b: 348). Analysing the literature of and the best practices in public sector real estate, one can clearly spot an unsolved problem concerning the degree of public sector real estate asset ownership separation from its management. The degree of separation varies from government to government, but in general two common and distinctly different models are employed (Kaganova, McKellar and Peterson 2006: 19):

1) the first model assumes a government retains direct ownership of property assets (or at least the biggest part of the "bundle of rights" associated with ownership) and delegates asset management functions to another entity, usually by contract;
2) the second model assumes that property assets, along with property asset functions, are allocated to a separate legal entity owned by the government (in Western countries, this entity is often a corporation); in such a case, the corporation, not the government, owns the asset, while the government owns or controls the corporation.

Both models evoke a number of questions, mainly about the governing of these asset management entities and the relations with them (*Ibid*.).

The basis for the management models applied within the current paper has been taken from the best practice experience from Germany. The German KGSt[22] differentiates among three kinds of organisational models for public sector real estate management: 1) the ownership model; 2) the landlord and tenant model; and 3) the management model (Schulte and Ecke 2006: 238). Accordingly, the characteristics of the named models are explained and summarised in Table 21.

[22] *Kommunale Gemeinschaftsstelle für Verwaltungsvereinfachung* (Municipal Community Office for Administrative Management).

Table 21. The organisational models for public sector real estate asset management in Germany.

Model	Description
The ownership model	In this model, the assigned property user is accountable for all key functions related to the occupied property, such as maintenance, facilities management, and cost tracking. Given the fixed budget, the user is also responsible for interacting with external service companies.
The landlord and tenant model	In this model, two roles are defined within the government organisation: 1) one representing the property tenant, and 2) the other the landlord as the property owner. The tenant's role usually belongs to a user department (e.g., school), while the landlord role is attached to a separate real estate entity managing the set of government's real estate. The tenant has two main responsibilities: 1) minimizing all costs related to operating the property, and 2) paying agreed fees to the landlord (e.g., rent, service charges, etc.). The landlord must in turn: • manage and maintain the property according to a rental contract, • coordinate with third-party service providers, • take care of property maintenance, and • meet the government's policy requirements.
The management model	The model is a combination of the previous two models, with an additional management role. Besides the tenant and the landlord, the additional management unit is responsible for property management and maintenance activities. Being a very flexible model, individual service agreements with the tenant or the landlord define the tasks of the management unit.

Source: Schulte and Ecke 2006: 238.

Taking into consideration various theoretical aspects from the existing literature about PREAM, also considering various aspects from the best practice concepts, there has been constructed a matrix-based scheme of possible models of PREAM (see Figure 14) that would suit the best for the further in-depth analysis. A management-ownership matrix in Figure 14 describes the basis for the possible formation of PREAM models from the perspectives of ownership, general asset management and space user. The models analysed and tests in further detail covered in the empirical part of the thesis, are marked as model 1, model 2, model 3 and model 4. All of the models assume a state is the user of the real estate, but its ownership and the asset management perspective can vary, being a state, a state-mediated agent or the private sector.

Real estate		Asset management		
		state	state-mediated agent	private-sector
Ownership	state	1	2	
	state-mediated agent		3	
	private-sector			4

Figure 14. The matrix of the base models of public sector real estate asset management[23] (PREAM) for further analysis (Source: compiled by the author.)

The financing parameter in the matrix on Figure 17 has been taken into account implicitly. In detail, the main parameters that are used to define the PREAM models (see also Table 22) can be expressed as {o,m,f}, where "o" is defined as "ownership", "m" as "asset management" and "f" as "financing", all of them being identified by state (S), state-mediated agent (M) or private investor(s) (P).

Table 22. The identification of the parameters defining the PREAM models.

	Ownership	Asset management	Financing
Model 1	State	State	State
Model 2	State	State-mediated agent	State
Model 3	State-mediated agent	State-mediated agent	State-mediated agent
Model 4	Private investor(s)	Private investor(s)	Private investor(s)

Source: compiled by the author.

Therefore, the parameters for the PREAM models can be expressed as:

- Model 1 = {S,S,S}
- Model 2 = {S,M,S}
- Model 3 = {M,M,M}
- Model 4 = {P,P,P}.

In general, two rent-based and two cost-based PREAM models (see Table 23) are considered. Depending on the classification of public sector asset, the rental model can be analysed according to either a cost-based or a market-based rental.

[23] For clarity the models are numbered as 1, 2, 3 and 4, depicting them in the empirical part as PREAM model 1, model 2, model 3 and model 4, respectively.

Accordingly, the cost-based rental model is applied only to special-purpose property (SPP) and the market-based rental model is applied to general-purpose property (GPP) (see Table 23).

Table 23. An overview of the cost- and market-based models.

	Model 1	**Model 2**	**Model 3**	**Model 4**
GPP	CB	CB	MBR	MBR
SPP	CB	CB	CBR	–

Source: compiled by the author.

– market-based rental (MBR) model

– cost-based (CB) or cost-based rental (CBR) model

In this thesis the basis for analysis is taken from the case of the set of Estonian state buildings (described in subchapter 3.1.). Therefore, table 24 gives a more detailed description of the PREAM models derived from the information gathered from the literature and also in collaboration of the Department of Finance in Estonia.

Table 24. General description of public sector real estate asset management (PREAM) models (based on the set of Estonian state buildings).

Descriptive factors	**Model 1 (non-rental)**	**Model 2 (non-rental)**	**Model 3 (rental)**	**Model 4 (rental)**
Applied to...	...both general purpose and special purpose property			...general purpose property only
Ownership	State ownership	State ownership	State-owned enterprise (RKAS*)	Private ownership
Management	Decentralized (by state institutions)	Centralized (by state-owned enterprise (RKAS))	Centralized (by state-owned enterprise (RKAS))	Private ownership
Financing	State budget	State budget	State budget through state-owned enterprise (RKAS)	Private capital
Costing	Cost-based	Cost-based	Cost-based (SPP), market-based (GPP)	Market-based
Space optimization	None	None	Moderate	Moderate
Returns to scale	None	Moderate	Moderate	High
Management strategy	Passive	Reactive	Proactive	

* RKAS – Riigi Kinnisvara AS (*State Real Estate Ltd*), Estonian 100% state-owned real estate enterprise.

Source: compiled by the author, based on theory and Ilsjan 2010–2011 (interviews).

The PREAM models discussed in this thesis are based on an interdisciplenary view, but targeted to achieve a very specific aim – to show the complexity of real estate asset management decisions in the public sector. A more detailed description of the PREAM models (described in Table 24) is given in the third, empirical, chapter of the thesis.

Given that, the author has drawn a following general research question (RQ.2a) and three propositions directly related to the research question:

***RQ.2a**: Which form of management and ownership of public sector real estate assets generates the least negative fiscal impact on state budget and government sector account?*
***Proposition 2:** State-performed centralised form of ownership combined with state-mediated centralised form of management of public sector real estate assets generates the least negative fiscal impact on state budget and government sector account.*
***Proposition 3:** State-mediated centralised form of ownership and management of public sector real estate assets generates the least negative fiscal impact on state budget and government sector account.*
***Proposition 4:** The disposition of public sector real estate assets to the private sector and leasing back required space, generates the least negative fiscal impact on state budget and government sector account.*

2.2. Continuum of PREAM model evaluation methods

2.2.1. Different types of economic evaluation methods

This sub-chapter elaborates on and discusses a continuum of economic evaluation methods in order to detect the most suitable methodology for the evaluation of the PREAM models developed in Chapter 2.1.

In the theoretical part, a conceptual framework for PREAM was drawn up. The factors for PREAM measurements have been taken from various theories related to the topic. An overview of these has been gathered on Figure 27, in sub-chapter 2.4. Hereby, the appropriate methodology for applying these measurements in order to analyse the financial feasibility of public sector real estate, is introduced. As governments make decisions for the long-term, then the following discussion is often emphasized by long-term project evaluation. Therefore, considering the subject of the current research, the author interprets the issues concerning PREAM as separately (partially even case-by-case) handled problems that can be solved, using a long-term project-based analysis approach. Thus, discussions about methods evaluating long-term public sector projects are applicable also within the current thesis, both in terms of a single real estate object as well as on the level of an aggregated set of real estate.

The appraisal of public sector related projects is topical both in theoretical and empirical literature. Exploring various kinds of literature on the topic, one can find three commonly used methods for analysing public sector related projects in financial terms. Firstly, it is possible to perceive that both scholars and also practitioners are in favour of using the benefit-cost analysis (BCA) or cost-benefit analysis (CBA) method. This type of analysis quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value. In other words, the BCA or CBA method is also called the net present value (NPV) analysis method.

According to Zerbe and Bellas (2006: 10), BCA or CBA is a methodological framework developed in the 1930s and is still actively used in public policy decision-making. This kind of analysis approach forms also the core of a substantial part of the normative foundation of thinking under the wealth maximization issue. As Zerbe and Bellas (2006) state, benefit-cost is more closely associated with economic approach and cost-benefit closer to engineering approach, therefore the author of the current thesis founds benefit-cost analysis (BCA) more appropriate to use within the empirical part of the thesis.

The other common method used in the public sector decision-making process, is the cost-effectiveness analysis (CEA). CEA is a systematic quantitative method for comparing the costs of alternative means for achieving the same stream of benefits or given objects (Kohyama 2006: 3). In other words, the essence of that type of an analysis method is to compare the costs of alternative ways for producing the same or similar outputs. CEA is similar to BCA except that it does not attempt to place a value on the major benefits of the proposal. Instead, CEA compares the costs of alternative ways of producing the same or similar kinds of outputs or benefits. It is often used to find the option that meets a predefined objective at minimum cost.

The third method, used mainly in health economics, is the cost-utility analysis (CUA), being a version of CEA that measures the relative effectiveness of alternative interventions in achieving two or more given objectives. Both CEA and CUA provide measures for the relative effectiveness of alternative interventions in achieving a given objective (or two given objectives in the case of CUA). The unit of measurement is usually non-monetary. See also Broadman *et al*. (1996), Dixon (1991), Stokey and Zeckhauser (1978), Viscusi (1997), and Pradhan (1996). (Cost Benefit Analysis Primer 2005: 8)

There is also an analysis method called multi-criteria analysis (MCA), which is based on qualitative analysis techniques and cost-minimization analysis (CMA), based on comparing the costs of alternatives with the same outcomes. For example, Vijverberg (2000) and Fritzsche *et al*. (2004) (via Arkesteijn *et al*. 2011 and Zwart *et al.* 2009) have used MCA in their research on municipal real estate management problems, and Dewulf *et al*. (2000) has tested strategies of MCA-like scenarios. Both MCA and CMA are ignored in this research.

Therefore, for the evaluation of long-term public projects, CBA has generally been applied by means of the NPV method with an exponential discounting function and a constant discount rate. When dealing with public projects, especially projects with a long-term horizon, it is important to adopt a social cost-benefit analysis that implies the valuation of tangible and non-tangible costs and benefits and the use of a social discount rate. (Rambaud and Torrecillas 2006: 76)

On the other hand, by examining what determines the costs and benefits and how they are likely to vary, policy-makers are encouraged to consider different approaches and determine the best way to achieve objectives. Identifying and measuring costs and benefits encourages close examination of the factors that influence them and assists in minimizing costs and maximizing benefit, helping decision-makers increase the net benefits of the society. (Harrison 2010: ix)

Wherever possible within this thesis BCA will be undertaken from a national perspective rather than a government or departmental perspective, considering all benefits and losses regardless of to whom they accrue. An alternative approach to the national perspective is "financial analysis", which considers the case when costs and benefits are limited to impacts on an individual agency or department. (Cost Benefit Analysis Primer 2005: 11)

According to Fuguitt and Wilcox (1999: 52), one of the points of criticism levied against BCA concerns its use of monetary valuation or in other words – money is the only unit measure in BCA. Based on that, the hardest part of the BCA is the assessment of non-tangible social costs in monetary terms in projects, where it would be necessary.

In this thesis, BCA is conducted on an *ex ante* basis, taking account only direct tangible costs related to public sector buildings as much as possible. The first step of the BCA is to collect all income and cost related data applied to the set of state real estate asset, based on Figure 13, derived through the theoretical conceptualization of PREAM.

According to Mihaiu 2010, measuring the effectiveness of public expenditure is essential in the analysis of public sector performance, efficiency being an indicator of the performance. Benefit-cost analysis (BCA)[24] is a method for measuring the efficiency of public spending, but it has certain deficiencies, which have been reported in this thesis (see Chapter 3). The purpose of BCA is to show, based on the results expected, if the investment, or the public expenditure, is appropriate or not, and to lead to identifying the best choice, the one with the highest efficiency. BCA must take into account all possible benefits, not just the economical ones, based on economic, social and environmental impact studies, then attempt a monetary quantification of the effects (although in some areas this is more difficult to realise). The aim is to eventually conclude if the investment is worthwhile and if it brings a contribution to increasing social welfare. BCA is used also as a tool for making decisions regarding spending public money in the public sector. However, it may have some errors, such

[24] About the applications of BCA see further from sub-chapter 2.2.2.

as errors of omission, of forecasting, of evaluation and measurement. The quality and accuracy of BCA depends also on the skill and good will of the analyst and on the complexity of the matter. BCA offers great results regarding investments that have a strong economical component, or whose costs and benefits can be easily quantified. (Mihaiu 2010)

Together with BCA, sensitivity and also scenario analysis methods are often used. Sensitivity analysis examines how BCA results change when inputs and assumptions are modified. If the results change considerably, the BCA is considered sensitive to variations in its assumptions; otherwise, if the results do not change considerably, the analysis is said to be robust.

Table 25 summarises the attributes of the methodological approaches of various analysis methods: cost-benefit analysis (CBA), benefit-cost analysis (BCA), cost-effectiveness analysis (CEA) and multi-criteria analysis (MCA).

Table 25. Comparison of methodological approaches of CBA, BCA, CEA and MCA.

Attribute	CBA	BCA	CEA	MCA
Input data	Monetary	Monetary	Monetary or quantitative non-monetary	Non-monetary
Result	Objective	Objective	Objective	Subjective

Source: compiled by the author.

This thesis also considers the relation of FIA. In theory, FIA is a comprehensive study of all government revenues, expenditures, and savings that will result from a proposed policy or program. State and local fiscal offices routinely produce FIA, which is known as "fiscal notes" when prepared for draft legislation. This type of analysis helps policymakers determine whether a proposed initiative is affordable from a budgetary standpoint. Often FIA is conducted specifically in case of public real estate projects.

FIA technique has been in use already since the 1930s. Planners first employed this type of evaluation in the early public housing effort of the 1930s to justify the replacement of deteriorated structures due to their negative local fiscal effects. In the late 1940s, it was used in an urban renewal movement to demonstrate revenue generating superiority of new land use that would replace the old. Since then its employment grew steadily until the 1970s. FIA is now used to project the economic impact of alternative development proposals, major zoning or subdivision review plans, for boundary changes, municipal annexations, large scale, mixed-use developments or new communities, and as an integral part of the filing procedure for an environmental impact statement.

FIA only considers the direct impact of current costs. It projects only the primary costs that will be incurred and the immediate revenues that will be generated. Direct or primary costs include, for example, both capital and

operating expenditure of real estate assets. Direct or primary benefits include real estate market value in terms of their privatization.

In this thesis, FIA has been applied on two levels. Fiscal impact on state budget and also fiscal impact on government sector accounts have been calculated. Both of these impacts are reflected on the basis of free cash flow (FCF).

FIA and BCA both provide valuable information about the economic impact of programmes and policies. But there are a few important differences between the two:

- Taxpayer costs: FIA focuses on taxpayer costs, measuring the impact of a particular initiative on government spending and revenue. BCA goes beyond taxpayer costs to examine public safety and other outcomes and considers the perspectives of additional stakeholders, including victims, offenders, and programme participants.
- Time periods: FIA measures the economic impact over a budget-planning period of three to five years, while BCA examines the impact over a longer period, sometimes up to 30 years.

As buildings may last sometimes even over generations, then in order to maintain a long-term perspective, the analysis applied to the PREAM models uses combined cash flow valuation with a 30-year approach together with residual value technique both in BCA and FIA.

2.2.2. Application of benefit-cost and fiscal impact analysis method

In implementing the benefit-cost analysis, the overall idea is to take into account all the incremental benefits and costs associated with the research object. Based on Friedrich (1991), the general formula for net benefit in BCA is as follows (see Formula 2):

$$\begin{aligned} \text{Net Benefit} = {} & \text{Turnover} + \text{Consumer Surplus} + \\ & + \text{Monetary Value of Positive External Effects} - \\ & - \text{Factor Rents of the Producer} - \text{Costs} - \\ & - \text{Monetary Value of Negative External Effects} \end{aligned} \tag{2}$$

However, as only tangible or direct monetary benefits and costs are considered within this research and intangible benefits and costs have been left out, then the consumer surplus, values of external effects and factor rents have been ignored and set to zero in Formula 2. Through that Formula 3 has been reached as follows:

$$\text{Net Benefit} = \text{Turnover} - \text{Costs} = \text{Profit}, \tag{3}$$

where the result of the formula, at least on the FIA level, is interpreted as free cash flow (directed either to SB or GSA).

Although in the literature it is possible to find several ways and suggestions for the application of FIA, then according to Burchell *et al*. 1985 and Lamie *et*

al. 2012, the fiscal impact assessment methods can be divided into cost and revenue estimation methods. The two cost estimation approaches that practitioners most often use in FIA methods are average costing and marginal costing (Kotval and Mullin 2006: 4). Each of these approaches includes three specific estimation techniques (see Figure 15).

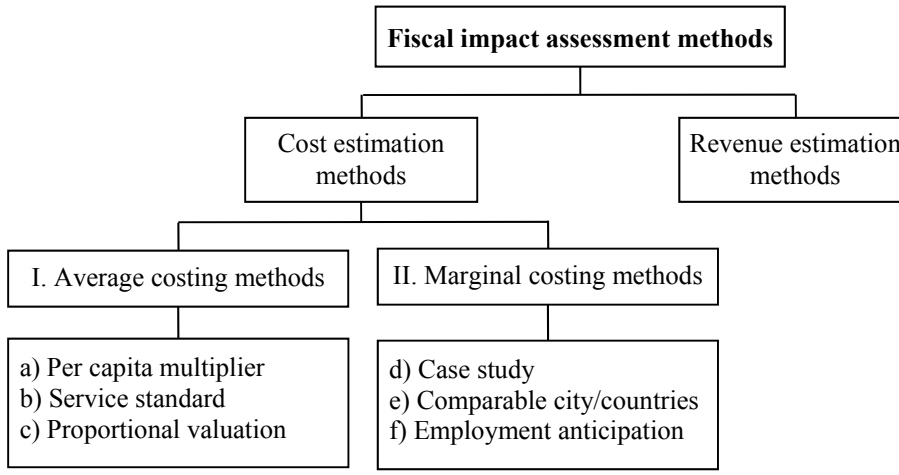


Figure 15. An overview of fiscal impact analysis (FIA) and its assessment methods (Source: compiled by the author, based on Kotval and Mullin 2006: 6, Lamie *et al*. 2012.)

Table 26 summarises the possible strengths and weaknesses of cost estimation methods used in fiscal impact assessment, taking into account the cost estimation classification methods from Figure 15.

Table 26. Strengths and weaknesses of cost estimation methods used in fiscal impact assessment.

Method	Strength	Weakness
Per capita multiplier	Readily available data, simple calculations, intuitive.	Assumes multipliers remain constant over time. Ignores possible changes in service levels. Does not incorporate the already available capacity of public services.
Service standard	Low cost. In practice, standards are relatively stable over time.	Standards may not be available for all categories. New categories of services may exist in the future.
Proportional valuation	Commercial and industrial impact applications generating significant changes in the value of industrial land.	Provides rough estimates, especially compared to the case study method. Expenditures may not be proportional to the value of industrial land.

Method	Strength	Weakness
Case study	Takes already available capacity into account. Utilizes local expertise.	Not always clear when new facilities will be needed.
Comparable city/country	Useful for examining rapid fiscal changes. Attempts to account for changes in multipliers over time.	Different geographic and political situation (different underlying conditions).
Employment anticipation	Commercial and industrial impact projects generating significant changes in employment.	Relationship between employment and municipal expenditures varies across developments.

Source: Lamie *et al*. 2012, Burchell *et al*. 1985.

In general, the average cost approach is used most often because it is more straightforward and relies on data that is easier to obtain (Morgan 2010: 7). Although the average costing method techniques have been applied for the evaluation of fiscal impact both in the case of SB as well as GSA also in present thesis, it is still worth mentioning that a slightly modified version of the suggested FIA application methodology has been used, since it was found more suitable for the current research topic. Firstly, this study considers only direct tangible costs and benefits, whereas all indirect or overhead costs and benefits, as much as intangible costs, are excluded from the analysis. This is done in order to avoid mistakes from inappropriate use of heuristics to derive the monetary cost of the intangible elements. This means that the possible social costs of PREAM models would be ignored within the empirical analysis of FIA.

The main benefit item used in the empirical analysis is sale revenue from real estate assets disposition to the private sector, either because of the decisions made about space optimization or the decisions made about sale and lease transactions. The main cost items used in the analysis are maintenance costs, capital expenditure costs, transaction costs, and costs of sales.

One of the crucial aspects is to consider the timing of forecasted costs and benefits that affect free cash flow and, in the end, also yearly fiscal impact on SB and GSA. One of the limitations of FIA as a decision tool is that it does not consider opportunity costs (Mucha 2007: 5–6), which is why discounting method have been applied to assess yearly fiscal impact.

Hence, BCA should in principle include a sensitivity analysis, involving the evaluation of time profiles for a range of values, ρ and ε (see e.g., Ramsey equation) (Creedy 2007: 2).

2.3. Methodology for assessing and modelling input data in PREAM models

2.3.1. General principles in modelling input data in PREAM models

The following sub-chapter discusses the essence of the basic financial factors influencing PREAM, which are relevant to forecasting cash flow in FIA.

Approach to real estate market

In order to discuss input data modelling of long-term cash flow of PREAM models, stemming from the set of state buildings to the public sector in detail, it is important to get some insight into the general performance of the real estate market. This dissertation follows an approach developed by several authors, e.g., DiPasquale and Wheaton (1992), supported also by Geltner and Miller (2001), whereby the general real estate market can be divided into a real estate space market and a real estate asset market. These two markets can also be viewed and analysed separately.

The best overview about the mechanics of real estate market performance is given by the four-quadrant Fisher-DiPasquale-Wheaton (FDW) model (see Figure 16), that underlines also the comprehensive nature of real estate market dynamics. Also, the model depicts the possible inputs necessary for forecasting and modelling both the real estate market in general as well as the market rental price within it. However, although on Figure 16 the FDW model is represented as being static, there is also a possibility to use the model in forecasting the changes of the real estate market in a dynamic way.

As Geltner and Miller (2001) explain, the space market is a market, where the bargaining object is the right to use a real estate space (the demand-side is determined by the space users) and within the asset market the bargaining object is the right to own a real estate asset (the demand side is determined by the investors). One of the distinctive features of the space market is a high segmentation of the market into smaller sub-segments. Market segmentation is taking place according to geographical location, taking into account also the type (i.e., office, retail, warehouse buildings) and the quality of the property (i.e., A-, B- or C-class of quality). The asset market, on the other hand, is highly integrated. In principle this means that investors do not care about the specific features of the real estate object itself, but only about the relationship between the cash flow it generates and the risks it bears.

As real estate assets are an integral part of the overall economy, the changes in real estate value or transaction volume on the asset market may cause serious influential consequences in almost every sector of the economy. For example, a reduction in real estate sales may eventually lead to a decline in real estate prices (Maier and Herath 2009: 2), which in turn means also a decrease in the value of the collateral of mortgages, that in its turn may severely hurt the health of the whole economy. This was seen clearly during the latest major recession in 2008–2010. In general, the real property market can be characterised by heterogeneity of property interests, the lumpiness of property as an investment, the

relatively long transaction time required, and also the presence of an agglomeration of sub-markets, rather than a central market and the imperfections of the property market.

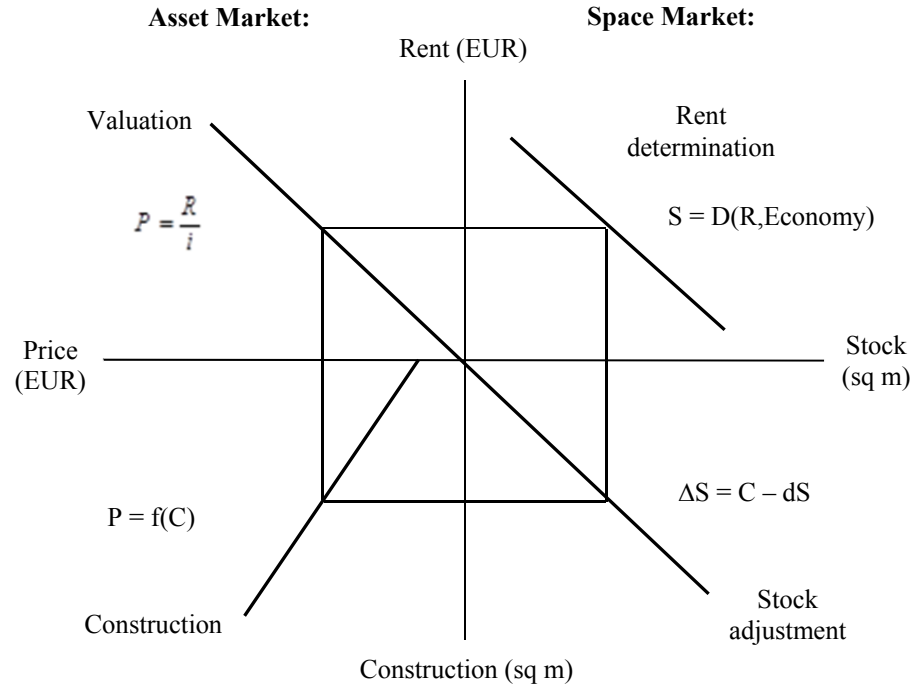


Figure 16. The static presentation of Fisher-DiPasquale-Wheaton (FDW) model for representing the interaction between real estate space and the asset market (Source: DiPasquale and Wheaton 1992: 188.)

Clayton *et al*. (2009: 5) state that, in real estate markets, heterogeneous properties trade in illiquid, highly segmented and informationally inefficient[25] local markets, where the inability to short sell private real estate restricts the ability of sophisticated traders to enter the market and eliminate mispricing[26].

As far as the aim of the thesis considers analysing a set of state buildings, the modelling of a long-term building cycle is essential for forecasting cash flow from and to the state budget and also to the government sector account. According to Barras (2009: xiii), building cycles (in terms of the construction market) are the source of the greatest volatility in economic growth.

[25] Informationally inefficient market is considered to be a market, where market participants are not fully informed about prices and characteristics of real estate assets.

[26] Mispricing is a phenomenon that occurs in real estate market in times, while the price that is paid in the market may not be the same as the price that should be paid. In this context, the long-run value of real estate asset may be considered its fundamental value component, while the part of the real estate asset price that deviates from the long-run value is its mispricing component (Chen *et al*. 2009).

Space optimization

One of the crucial aspects in PREAM is the strategic management of surplus property. The aim of space optimization is to use and manage space with lower cost, without a loss in public sector administrative functioning. According to Cock and French (2001: 272), by eliminating surplus space, a company's overall cost of occupation will decrease (and may release capital if the surplus space is disposed of on the open market) and this will directly lead to higher profits.

The research conducted by the UK government in 2008 showed that the most efficient way of strategically reducing or managing cost is through careful space management. Space and its location are the primary drivers of cost performance. It was also found that the costs will be higher where there is more space allocated per person, so organisations need to manage their occupation density in order to be efficient. (HM Government 2009: 38)

The amount of space being disposed is directly derived from the normative amount of space per administrative worker within the institution. The same methodology is used also in PREAM models, where the potential number of administrative workers is reached through the forecasted number of total population in the country. The reason for that kind of approach is in the logic that the lower the number of total population the fewer administrative workers are needed, and vice versa.[27]

Returns to scale and economies of scale

There are two broadly used concepts known in economic theory – i.e., the economies of scale and returns to scale. Economies of scale refer to the phenomenon whereby it is cheaper and more efficient to produce more of a good or service in large volume at fewer sites. Bers and Springer (1997) showed that economies of scale exist for the US real estate investment trust (REIT) industry and that the measurement of scale economies is sensitive to the model used for the measurement. In their research they used the scale economy measures representing the percentage change in input (expenses or costs (C)) associated with a percentage change in output (as an output for REIT was considered the capitalization of the assets or average total assets (A) and the dividends paid out to shareholders (D)). For a set of assets, the overall scale economy estimator (SCE_o) is the reciprocal of the sum of estimated cost elasticities of the individual outputs as it is outlined in Formula 4, thus (Bers and Springer 1997: 279):

$$(4)\ \mathrm{SCE}_o = \frac{1}{\sum\left(\delta_A + \delta_D\right)},$$

where $\delta_A = \partial \ln C / \partial \ln A$ and $\delta_A = \partial \ln C / \partial \ln D$.

Although professionals usually expect cost reduction from the outsourcing of the real estate services, there is no clear proof to the return to scale argument in that matter. For example, as Stoy and Kytzia (2005) has shown in their sur-

[27] As the global market recession during 2008–2010 showed, this kind of logic does not always hold in (e.g., in Greece, Spain).

vey conducted among a set of office buildings in Switzerland, outsourcing results in higher costs for some cost groups and in lower costs for others – e.g., the administrative costs and also the costs of utilities and waste disposal showed higher cost results in terms of outsourcing and for cleaning costs, the costs are lower when outsourcing property management.

This research assumes only the presence of returns to scale, which is taken into account in the context of maintenance costs of buildings. By definition, the returns to scale is viewed as savings in transaction costs, achieving more efficient management of costs due to the centralized offer of asset management services via a state-owned real estate company. For example, it is reasonable to assume that state-owned company that manages the whole set of state real estate assets can achieve smaller unit cost per order of materials (either building costs or other) than a single state institution (e.g., a ministry).

Since direct assessments of the scale economies (i.e., percentage decrease in average costs as assets increase) are not possible (Bers and Springer 1997: 289), only approximate estimations of returns to scale are used in the empirical part of the current thesis. Principally, it is assumed in this paper that in terms of centralization, *per se* the returns to scale effect exist and that this should be considered.

2.3.2. Measuring and modelling the public sector real estate asset depreciation

The following sub-chapter discusses the essence of real estate assets (buildings) depreciation and its dependence on capital expenditures as a major cost centre. Knowledge about the essence of depreciation and its measurement possibilities is important in order to model the costs from the set of state buildings during the 30-year forecasting period as precisely as possible. Knowing and taking into account the proper depreciation of a building, enables the manager of the building (either a state or a state-owned company) to time improvements correctly and optimize capital expenditure costs of the building during its life cycle. The overall aim of this is to lower the negative fiscal impact on the state budget and government sector account as much as possible and thereby save taxpayers' money.

As depreciable assets come in many forms, there are still large gaps in literature that need to be filled in order to develop comprehensive estimates of depreciation for tax and accounting purposes (Hulten 2008: 1). Also, as it is asserted by Diewert (2005), accounting for the contribution of capital to production is more difficult than accounting for the contributions of labour or materials, because – when a reproducible capital input is purchased for use by a production unit at the beginning of an accounting period, it is not possible to simply charge the entire purchase cost to the period of purchase. Since the benefits of using the capital asset extend over more than one period, the initial purchase cost must be distributed somehow over the useful life of the asset.

This is the fundamental problem of accounting (Diewert 2005: 480), which has been solved by the calculation of asset depreciation.

There is still an ongoing academic debate on the meaning of depreciation; one group considers it an allocation of costs, while the other group sees it as the loss in value from one period to another. Despite the conceptual confusion in depreciation studies, most of the authors tend to agree that depreciation is closely related to the concept of capital and capital maintenance. (Kaliczka 2011: 2) Therefore, it is possible to draw a direct link between depreciation, capital maintenance and capital expenditures.

Similarly to capital and capital maintenance that have two aspects, the monetary and the physical, also depreciation has a monetary and a physical aspect (see Figure 17). Depreciation in the physical sense is called mortality, or deterioration. Deterioration means that an asset's productive capacity can produce poorer services at the end of a period than at the beginning of it (Griliches 1963). In other words, because of the assets ageing, their physical characteristics change due to wear and tear. The deterioration can be divided into the retirement and the decay effect (Triplett 1996). Retirement means the loss of productive capacity, while decay means a decrease in productive efficiency of the surviving assets. Decay can be decomposed into input and output decay. Physical depreciation is closely related to the monetary, or economic, depreciation, which is seen as a loss in an asset's price due to physical depreciation and obsolescence. Obsolescence is the effect influencing value reduction in one unit of remaining productive capacity that is encompassed in depreciation. (Wykoff 2003: 2–3)

The age-efficiency profile of a capital asset is the rate at which the physical contribution of the capital asset to production declines over time as a result of wear and tear. This is in contrast to the age-price profile, or depreciation function as it is more commonly known, which shows the relationship between the age of a capital asset and its value. Clearly, these two profiles are related, but they need not be identical. For example, a lorry that has lost 10% of its value after a year may not have lost 10% of its capacity to transport goods. (Wallis 2009: 801)

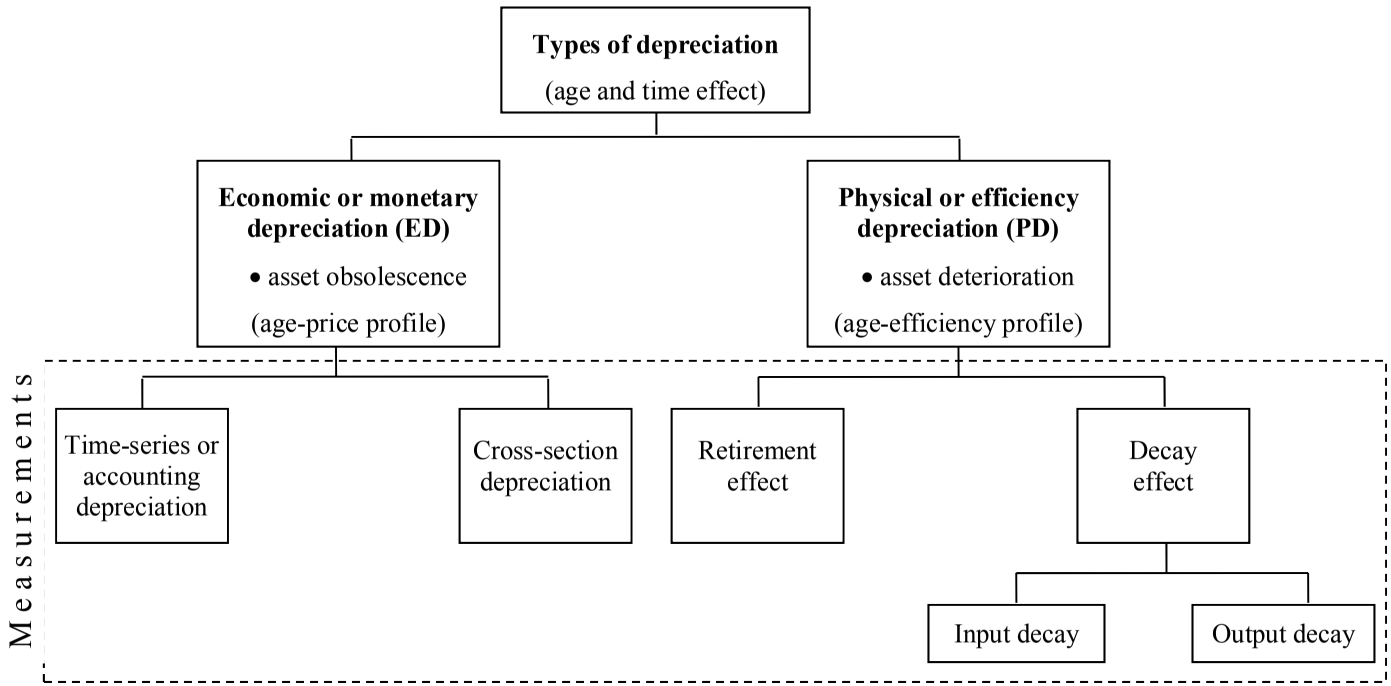


Figure 17. Asset depreciation: classification and measurement (Source: compiled by the author, based on Kaliczka 2011, Hill 1999, Ashworth 1996, Diewert 2005, Hulten and Wykoff 1981.)

According to Feldstein *et al*. (1974: 394), depreciation is the fall in the price of an asset as it ages. That kind of definition is originates from Hotelling (1925) and is elaborated further by several authors. For example, Wykoff (2003) declares: "Economic depreciation of an asset, or cohort of assets, is the decline in the price of the asset (or the price index of the cohort of assets) resulting from an increase in age holding time constant." According to Jorgenson's capital vintage model (1973), where the link between the rate of depreciation, $\delta(s)$, and the rate of efficiency decay, $d(s)$, is derived, depreciation can be interpreted as the amount of income that is lost because of a change in age-related change of efficiency in each of the remaining years of its life.

Economic depreciation (sometimes called just depreciation) is measured by the change in asset price or value (i.e., rate of depreciation), while physical deterioration is measured by a change in output quantity (i.e., rate of efficiency decay. These two measures are related, but in a complicated way. As explained by Hulten and Wykoff (1981: 90), one of the most misunderstood relationships in depreciation theory lies in the confusion between economic depreciation (obsolescence) and efficiency depreciation (deterioration). Physical or efficiency depreciation is the loss of an asset's ability to maintain a certain flow of services. Efficiency profiles are generally concave; i.e., most physical depreciation occurs at the end of the service life. (Tanguay 2004: 2)

As it was said previously, economic depreciation is an asset's loss of value that is associated with aging. Indeed, the decrease in an asset's service life reduces the remaining potential flow of services it is likely to provide and consequently, reduces its value. While the initial purchase is done during a specific accounting period, the services provided by this asset expand over many periods. The problem consists therefore, as explained by Diewert, of distributing the initial purchase cost over the useful life. Depreciation curves are generally convex, which means that most economic depreciation occurs at the beginning of the service life. (Tanguay 2004: 2) Economic depreciation is thus the change in the price of an asset due to a change in its age. The age effect, as previously mentioned, has two components: deterioration and obsolescence. Most studies do not differentiate between these two effects.

Hill (1999) has shown that two concepts of economic depreciation exist. One is the traditional accounting concept, described as time series depreciation, which measures the change in the value of an individual asset over time. The economic theory underlying time series depreciation dates back to Hotelling (1925) who defined depreciation as the rate of decrease of an asset's value with respect to time. The other concept is described as cross section depreciation, which measures the differences between the values of assets of different vintages at the same point of time. It is relevant when the vintages have to be aggregated to measure capital stock for the purposes of productivity analysis. The economic theory underlying cross section depreciation, which is based on the productive efficiency of assets, has been developed over the last three decades. (Hill 1999: 1)

Time series depreciation includes such a revaluation as an integral part of depreciation, whereas cross section depreciation implicitly treats it as if it were some kind of capital loss. In practice, obsolescence may be at least as important as declining efficiency in determining depreciation over time, but its role has been neglected in recent literature which has tended to focus on cross section depreciation. (*Ibid.*) While Griliches (1963) made one of the most thorough efforts to define the key concepts of capital measurement, such as replacement, depreciation, deterioration, obsolescence, and capital services, then according to Jorgenson's (1973) approach, there is a way to interpret the depreciation as the amount of income that is lost because of the change in age-related efficiency in each of the remaining years of assets life (Hulten 2008: 7).

In accounting, depreciation is defined as the measure of the cost or revalued amount of the economic benefits of a long-life asset that have been consumed during a period (The role of... 2002: 2). The US National Income and Product Accounts define depreciation as a decline in the value of an asset with age. This depends primarily on the profile of relative efficiencies of assets of different ages. As the asset ages, the discounted value of future capital services gradually declines. This decline can be measured at each point of time by observing the age profile of asset prices. (Jorgenson 1999: 2)

Empirical studies of economic depreciation are critical about accurate measures of economic wealth and capital services. Although the neoclassical theory of capital accumulation has been rigorously developed since the 1960s, empirical literature on depreciation has been much less fertile due to a lack of data. The absence of reliable empirical evidence has forced economists and statisticians to make assumptions on the forms and rates of depreciation for most of the assets in the economy. The OECD and the US Bureau of Labor Statistics recently highlighted the risk of using broad assumptions to derive asset specific depreciation rates, and called for more empirical work on depreciation by placing it on the forefront of the research agenda for capital measurement. (Patry 2007: 6)

Two commonly used depreciation functions are arithmetic and geometric. Arithmetic depreciation is a profile based on a constant annual amount of capital depreciation over the life of the asset. Geometric depreciation is a function based on a constant annual rate of depreciation over the life of the asset. For example, if the selected depreciation rate per annum is 10%, then 90% of the asset will remain after the first year, 81% after the second year, and so on. The advantage of this assumption is that the distinction between net and productive capital stock disappears and the age-price and age-efficiency profiles have the same shape. This means that, although depreciation actually refers to the loss in value of an asset because of ageing, the depreciation rate gives an appropriate age-efficiency profile. (Wallis 2009: 801)

One of the characteristic features of physical or efficiency depreciation is that in graphical expression it forms a concave curve, as most physical depreciation occurs at the end of the service life. Economic depreciation, on the other

hand, forms a convex curve, while most of economic depreciation occurs at the beginning of the service life.

Among scholars, the most often discussed depreciation models are (Diewert 2003; Diewert and Lawrence 2000: 2; Patry 2007): the one-hoss-shay or light bulb model or gross capital stock model, backward S-shape model, straight-line or age-life depreciation model, linear efficiency decline model, and declining balance or geometrical depreciation model. Assuming that real rate of interest (r) is constant in any point in time, these models create the following depreciation patterns or profiles (Hulten 2008: 5 and Hill 1999: 6; see also Figure 18):

- the one-hoss-shay pattern[28], where an asset retains its full productive capacity (constant flow of services) up to the point it breaks down or is retired from production; thus, $\varphi(s) = 1$ for ages *s* between 0 and N, and $\varphi(N+s) = 0$ thereafter;
- hyperbolic pattern of decay (quantity or efficiency profile), where the quantities of services may decline very slowly at first, the rate of decline gradually accelerating as the asset gets older and begins to deteriorate physically; which has the general form as $\varphi(s) = (N - s)/(N - \beta s)$ for ages *s* between 0 and N, and $\varphi(N+s) = 0$ thereafter;
- straight-line pattern of decay of 1/N asset's productive capacity every year until retirement;
- declining balance or geometric depreciation pattern, in which efficiency declines at constant rate δ either indefinitely or until the asset breaks down or is retired on grounds of obsolescence; the period of depreciation is calculated as the depreciation rate times the asset value at the beginning of the period (yielding the sequence $\varphi(s) = (1-\delta)^s$).

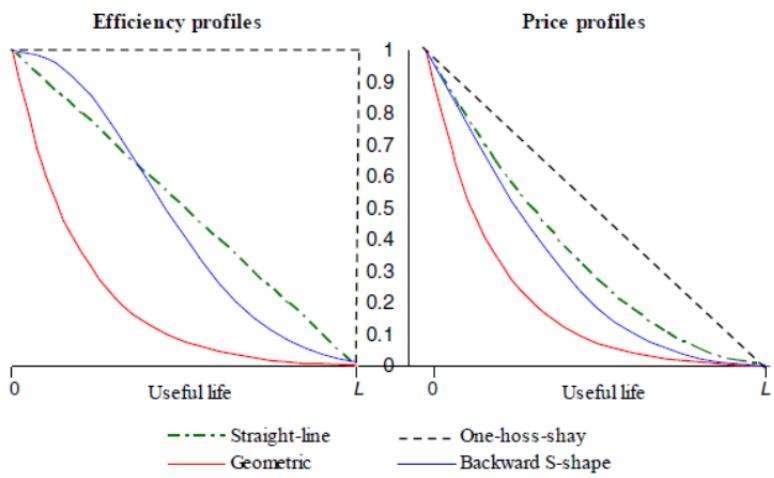


Figure 18. Efficiency and price profiles for various types of efficiency decline. (Patry 2007: 8)

[28] That kind of depreciation pattern is characteristic to a light bulb, for example.

Under the one-hoss-shay profile (see Figure 18), the asset retains its full productive capacity up to its useful life. In this case, the annual service generated by older assets will be exactly equal to that of a new asset (R_o) since there are no differences in efficiency. The resulting price change will equal the foregone annual service since the asset has one less period to produce income. Therefore, depreciation costs will be evenly distributed over the life of the asset, leading to a linear decline in price. Contrary to the one-hoss-shay profile, the straight-line and the geometric efficiency profiles both produce convex age-price profiles. As the decline in efficiency becomes increasingly frontloaded, the age-price profile will become increasingly convex. Note that a geometric efficiency profile leads to a geometric age-price profile with the same rate of decay. Another efficiency profile discussed in the literature is the inverse S-shape profile. Under this process, the relative efficiency of the asset slowly declines in the early years of life but accelerates as it closes in on its useful life. The corresponding age-price profile resembles a straight-line changing to a convex shape as it gets closer the useful life. (Patry 2007: 7–8)

Several empirical evidences (e.g., Katz and Herman 1997; Fraumeni 1997: 7) on the prices of used equipment and structures in resale markets have shown that for most types of assets (including industrial and office buildings, warehouses) depreciation approximates a geometric pattern. The general conclusion which emerges from a number of studies is that the age-price patterns of various assets have a convex shape (Hulten-Wykoff 1981a: 106). For identifying the shape of the depreciation function, the Box-Cox power transformation is used for estimation (see e.g., Box *et al*. 1964).

In theory, the price of a new asset is determined by the equilibrium between the cost of producing the asset and the value of the asset to the buyer. The value to the buyer may be related to the return obtained by renting the asset to subsequent users, or "renting" the asset to oneself. In the latter case, (i.e., when the asset is owner-utilized), the value of the capital services is usually called the quasi-rent or user cost (also, user cost of capital). Under perfect foresight (i.e., perfect information about the future), the value of the asset is simply the present value of the rents or user costs. In reality, other methods may be used in relating expected rents and user costs to asset values (e.g., the payback period approach). (Hulten-Wykoff 1981a: 106)

Walras (1874) and Böhm-Baweck (1891) were among the first to formulate the relationship between the price of an asset and the future flows of service it renders. Accordingly, the price of an *s*-year old asset (P_s) is equal to the present value of expected rents, which in turn is linked to the productive capacity of the asset, as it is equated in Formula 5 (Patry 2007: 7, see also Diewert 2003):

$$(5) \quad P_s = \sum_{\tau=0}^{T=L-s} \frac{R_{s+\tau}}{(1+r)^{\tau+1}} = R_0 \sum_{\tau=0}^{T=L-s} \frac{\varphi_{s+\tau}}{(1+r)^{\tau+1}},$$

where $R_{s+\tau}$ are the expected rents generated by the asset of age *s* at each point in time (τ), *L* is the useful life, *T* is the remaining years of production and *r* is the

discount rate. In the last part of the equation, $R_{s+\tau}$ is expressed as a function of the rents generated by a new asset (R_0) adjusted for the change in relative efficiency ($\phi_{s+\tau}$) as the asset ages. (*Ibid*.)

Hulten (2008) (following Hulten and Wykoff (1981, 1996), and Hulten (1990)) has shown that the average experience of a group of assets is better approximated by geometric depreciation than by other forms, even if each of the component assets in the group follows a different pattern, like the intuitively plausible one-hoss-shay. It means that, given the retirement distributions commonly in use, the group age-efficiency profile will tend to approach the geometric form of depreciation even if each individual asset is highly non-geometric. In other words, even if all assets in a particular grouping follow the "one-hoss-shay" pattern in which there is no loss of productivity until an asset is retired, the overall results are likely to be approximately geometric.

The problem with the price-based evidence supporting geometric depreciation lies in the intuition that most assets do not lose much of their productivity during the early years of their life, contrary to the prediction of the geometric form (Hulten 2008: 9). Buildings are a composite of long-lived components like the structural shell and shorter-lived components like the heating and electrical systems (*Ibid*.: 12). The measurement of depreciation called "perpetual inventory method" is a form of the accumulation equation that treats the stock of capital as an inventory to which the amount of new investment is added and from which the amount of depreciation or deterioration is subtracted (Hulten 2008: 13).

Tanguay (2004) has shown that there is a link between physical and economic depreciation and the usual rule of thumb used by accountants, multiplying a declining-balance rate (DBR) by the inverse of useful life, is mathematically consistent in the usual range of 2%–3%. The magnitude of DBR depends strictly on the capacity profile. It is not influenced by the fact that physical durations are random. A simple mapping can be built from the parameter of capacity profile into DBR. DBR can be expressed as a function of the average physical capacity of an asset over its useful life. (Tanguay 2004: 24) Table 27 gives a short overview of the depreciation rate estimates of physical capital assets as set out in various researches.

Table 27. Estimates of the depreciation rates of physical capital stocks.

Source	Range of estimates	Average estimate
Musgrave (1992)	0.030−0.038	0.034
Epstein and Denny (1980)	0.108−0.138	0.126
Kollintzas and Choi (1985)	0.107−0.141	0.125
Bischoff and Kokkelenberg (1987)	0.096−0.118	0.106
Nadiri and Prucha (1996)		0.059

Source: Nadiri and Prucha 1996: 49.

Bureau of Economic Analysis rates of depreciation for private non-residential structures range from 1.5%-3%, whereas the depreciation rates for private nonresidential equipment are in the range of 10%–30% (Fraumeni 1997, via Tuzel 2010). In Table 28, a result of a longer-term study carried out in the UK over average depreciation rates of different physical asset classes has been given. What is interesting is that over time the overall average depreciation rate for all assets has risen, building assets included. One of the possible explanations could be the actual shortening of the assets' economic life during the last decades due to the implementation of new materials, techniques and trends in modern architecture. For example, according to the knowledge of the author, no thorough research over the actual economic lives of modern flass-façade buildings has been carried out. Therefore, the calculations for the appropriate actual depreciation and also for yearly need for capital expenditures of such assets would also be complicated.

Table 28. Average annual growth in capital services by asset type in the UK, %.

Asset	1973–1979	1979–1990	1990–2000	2000–2006
Buildings	2.3	2.2	2.9	2.7
Plant and machinery	2.6	2.0	1.5	2.3
Vehicles	0.5	−0.7	0.3	1.2
Computers	n/a	n/a	23.3	16.1
Own account software	n/a	10.7	4.9	5.1
Purchased software	n/a	30.1	20.7	5.0
Copyright and license costs	11.2	5.5	5.2	3.3
Mineral exploration	12.8	7.0	−5.7	−8.8
All assets	**2.7**	**2.8**	**4.5**	**4.0**

Note: n/a, not available.
Source: Wallis 2009: 812.

Baum and McElhinney (1997: 2) have defined the depreciation of a building as, "… a real loss in the existing use value of property, in rental or capital terms, being one of the main drivers of the property investment performance". In their empirical research about London City office buildings' depreciation from 1986 to 1996, Baum and McElhinney found that the annual rate of depreciation in rental value over the first 35 years of life averaged 1.1%. The period of greatest depreciation in rental values was between years 17 and 26, where the annual rate of depreciation reached to 1.8%. The annual rate of depreciation in capital values averaged 1.6%. The period of greatest depreciation in capital values was years 20 to 29, where the annual rate of depreciation reached 2.1%. (*Ibid*.: 8) In addition, the same authors have stated that empirical evidence supports the intuitive suggestion that as buildings age, the contribution of building value to property value tends to zero and depreciation thereby disappears.

According to Fernández-Villaverde and Kreuger (2007), also Glaeser and Gyourko (2005) – real estate is highly durable with a slow depreciation, as it is

referred through Zhao and Sing (2011: 5). Also, as Tuzel (2010: 2269) says, "Structures, on average, depreciate much more slowly than equipment." For example, according to the Bureau of Economic Analysis (BEA) in the US, rates of depreciation for private nonresidential structures range from 1.5% to 3%, whereas the depreciation rates for private nonresidential equipment were 10–30% (Fraumeni 1997, via Tuzel 2010: 2269).

As it is seen from the above discussion, there is no one clear standpoint among scholars about the measurement and calculation of building assets rate of depreciation. According to the author's opinion, – the rate of depreciation of building assets is not a static, but a dynamic number over the years during the entire life cycle of the building, which depends heavily of the extension of the economic life of the parts of the building via the executed level of maintenance costs, discussed further in the next sub-chapter. Therefore, as there is a vast array of opinions about what is an appropriate depreciation rate for building assets, the author has developed an own approach for the dynamics of depreciation for a set of state buildings, based on the literature and various expert opinions (see sub-chapter 3.3.2.).

2.3.3. Measurement and modelling of public sector real estate asset maintenance

Discussion over building maintenance within this thesis is of utmost importance. As Muyingo (2009: 6) states, "From the perspective of investment theory everything that is usually classified as maintenance is also an investment." Therefore, as maintenance costs form a great part of the total investments of a building, then in order to determine the whole amount of the investment during the life-cycle of a building, it is important to determine the necessity for the amount of the building maintenance at first.

Building maintenance can be viewed in two ways: either it is directed to keep up or restore an existing function of the object (primarily for maintaining the value of the asset) or some kind of improvement is made to the object (for adding additional value to the asset). Either way some investments have been made to improve the physical condition of the building, regardless of whether the investments are small or large and whether they last for a short or a long period of time.

Many years ago, accountant Canning raised the following interesting problem on the topic of maintenance (Diewert 2003: 69): "By spending enough for parts replacements (repairs), it is possible to keep any machine running for an indefinitely great length of time, but it does not pay to do so. Query: How does one know just when a machine is worn out?" Canning (1929: 251). In other words, Canning notes that the choice of when to retire an asset is really an endogenous decision rather than an exogenous one. Therefore, it is possible to model the retirement decision in a preliminary way using the concept of a maintenance profile. (*Ibid*.)

One important sub-problem under the general achievement of cost effectiveness is cost effective maintenance management. Some obvious steps in achieving cost effective maintenance include selecting appropriate maintenance strategies and techniques. Using the wrong maintenance technique can waste time, money and resources, and often has no effect on improving or maintaining availability.

Smith's (1995) statement that maintenance is a cost management is quite often not understood well. The result is that maintenance becomes an "orphan" at the budget table, which leads to the decision-makers at an organisation failing to understand that maintenance is also an investment, an essential expense that ensures the long-term reliability and availability of operating equipment and infrastructure. Buys (2004) concludes that having a sound maintenance management system (policy), is one of the most important criteria in any facilities management department. Such a policy should ensure that sufficient funds are provided for maintenance. (Tonono and Buys 2008: 2)

The British Standard 3811:1993 glossary of terms (cited by Seeley 1976: 2) defines maintenance as, "Work undertaken in order to keep or restore every facility to an acceptable standard". Beyond engineering components, the importance of maintenance in property investment is re-echoed by the College of Estate Management (1995: 1) in its definition of estate management as, "…being concerned with the administration of tenanted land, including letting, control, rent assessment and collection, insurance, repair and renewal, and in general the care and maintenance of the estate with particular regard to conserving and improving its revenue – earning potential." On the other hand, the British Standard 3811:1993 has defined maintenance also as, "…the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function."

With buildings in general and also within the current thesis, it is important, how to device maintenance schedules in order to project major capital expenditures during the life cycle of the asset. In this matter, both the right timing as well as the right amount of maintenance is essential.

In EN 13306 (European Standard 2009), maintenance is divided into preventive (implemented before a detected default) and corrective (implemented after a detected default) maintenance, as it is seen on Figure 19. Both in the British Standard 3811 (1993) glossary of terms and also in the Swedish maintenance terminology standard SS-EN 13306 (2001), preventive maintenance is defined as, "the maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item and the effects limited." Preventive maintenance can be viewed also either as condition-based maintenance or predetermined maintenance.

Corrective maintenance is carried out after the default recognition and is intended to put an item into a state in which it can perform a required function. Corrective maintenance can be either deferred or immediate. In terms of deferr-

ed corrective maintenance, maintenance is not carried out immediately after the default has been detected, but is delayed in accordance to given maintenance rules. Immediate corrective maintenance, on the other hand, is carried out immediately, after the default is detected in order to avoid unacceptable consequences and potentially bigger maintenance costs in the future.

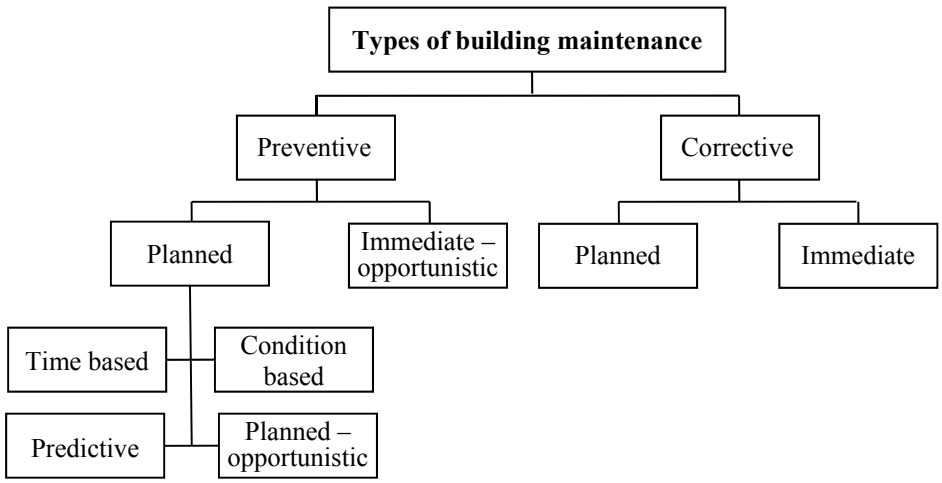


Figure 19. A model for building maintenance (Source: Lind and Muyingo 2012, adapted from EN 13306.)

The most frequently used form of building maintenance in public sector practice in general has been corrective rather than preventive. The newest trends in PREAM try to change that kind of mentality. Preventive maintenance is essentially expected, for example, from private investors in case of SLB transactions of public sector real estate; also from government-owned enterprises, initiated for owning and managing the set of public sector real estate.

In the literature, during the last two decades a lot of discussions have developed over the life cycle costing of buildings. Different kinds of approaches have emerged – there are scholars and practitioners, who discuss over the total costs of ownership (TCO) and those, who discuss over the life-cycle cost (LCC) of a building. As some authors use these terms interchangeably, and others make clear difference between these cost types, it is possible to find very different results concerning the buildings LCC structure. Some researches argue that in most buildings, the majority of LCC are operational and capital cost represents usually less than 25% of the total cost of ownership. On the other hand, other researches show (see e.g., Guidelines for Life Cycle 2005) that over 30 years of a building's life, the present value of maintenance, operations, and utility costs are nearly as great as the initial project costs.

Due to difficulties in measuring the exact distribution of costs of a building in a long-term perspective, there are several scholars, who argue over appro-

priate cost ratios of the commercial building over its life cycle. Some scholars have come up with a rule of thumb ratios used in situations, where it is difficult to obtain data for the measurement of actual life cycle costs of a building. For example, as Evans *et al.* (1998) argue in a paper given at the Royal Academy of Engineering, then for commercial buildings an approximate rule of thumb is that over the building's whole life the cost of operating a business in the building is 200 times the cost of construction and 40 times the costs of maintaining and operating the building (i.e., the so-called 1:5:200 rule[29]). However, because of the lack of solid argumentation over the statement of 1:5:200 rule[30], several other authors have criticized Evans' *et al*. (1998) work and have proposed their own rules of thumb, based on their own empirical analysis. One of those authors was Hughes *et al.* (2004), who came up with a corrected rule – 1:0.4:12, based on three UK office buildings, using year 1999 statistical data.

However, none of these arguments have been directly used in the empirical part of the current dissertation, except the recognition that the correctly timed and measured sum of improvement of a building should, in the future, prevent further accelerated depreciation and therefore maintenance is important for extending the overall economic life of the building.

2.3.4. Depreciation-based life-cycle costing and maintenance modelling of buildings

Physical capital, like machinery, equipment, and buildings, wears out through use and its efficiency tends to decline over time. Physical capital can be reproduced over multiple periods. With physical capital, reproducibility makes it possible to observe rental prices of different vintages of capital assets at the same point in time, and also used asset prices for different vintages. This in turn allows estimating depreciation rates for reproducible capital inputs. (Huang and Diewert 2011: 390)

In theory, if they are correctly designed and constructed and properly maintained throughout their lives, the life expectancies of buildings may be almost indefinite. However, in practice, their lives are frequently much shorter due to physical deterioration and obsolescence. (Ashworth 1996: 1)

Buildings deteriorate and become obsolete as they age; some depreciate more quickly than others. Depreciation is a function of age, but also of building quality or qualities. (Baum 1993: 541) Depreciation is a loss in the real existing use of property, whereas obsolescence is one of the causes for depreciation (Baum 1989). Obsolescence, therefore, is rather a decline in utility and not directly related to physical usage or the passage of time (Baum 1993: 545).

[29] 1 – construction cost; 5 – maintenance and building operating costs; 200 – business operating costs.

[30] Although in a paper by Evans *et al*. (1998), no methododology of measurement was given and used datasets were not referred to, the result of the research has still been well-cited and referred to in many other academic papers, even used broadly as a solid rule for making decisions in practice.

High building quality may lead to higher rental income and/or higher capital values, although it may not lead to higher returns (*Ibid*.: 542). In a period of inflation, property rents generally increase while yields (capitalization rates) might remain relatively stable over a longer term.

Since the 1970s, property-based depreciation has generally been discussed as being the result of two specific negative processes – physical deterioration and obsolescence (see Figure 20). These processes typically precede an escalating series of positive responses, such as repair, renewal, refurbishment and ultimately redevelopment, that seek to address them. It is important to appreciate that although inextricably linked within property's broader life-cycle process, physical deterioration and obsolescence are two separate issues. Given this, it is remarkable that in general property texts they continue to be discussed interchangeably. (Mansfield 2000: 7)

Baum (1989) and Khalid (1992) consider multiple building obsolescence factors to explain the impact of depreciation using a statistical model. There are fewer attempts to examine the effect of other factors except the property-specific; for instance to analyse whether an economic downturn would trigger the level of depreciation, especially in office investment sector (Md Yusof 2000: 3).

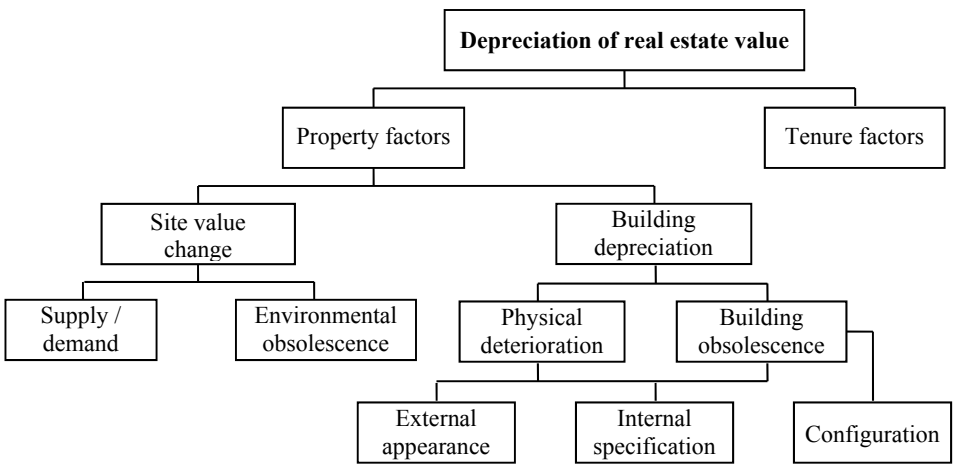


Figure 20. The classification of basic aspects related to the depreciation of the real existing use value of the property (Source: Baum 1993: 7.)

The essence of building depreciation in Figure 20 is elaborated further in the following Figure 21, where the link between building depreciation, its physical deterioration and obsolescence is brought out.

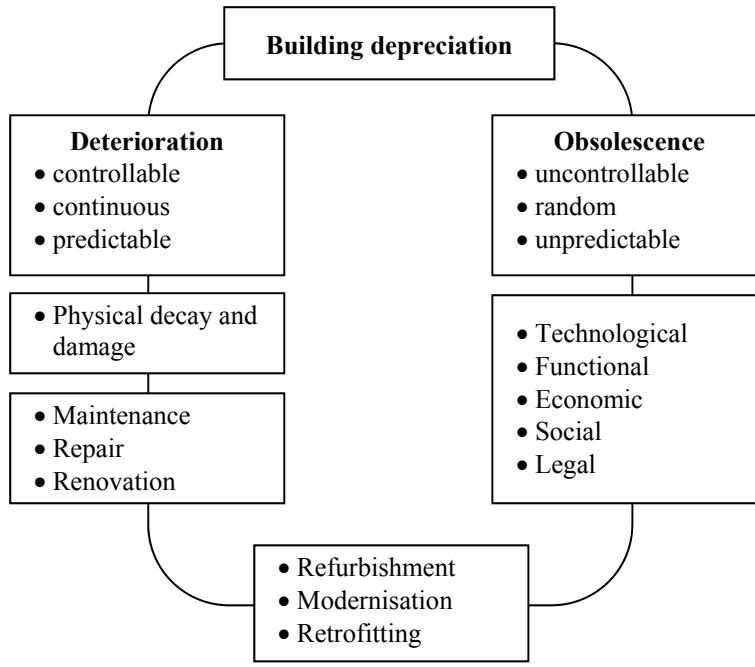


Figure 21. Link between building obsolescence, deterioration and depreciation (Source: adapted by the author from Flanagan *et al*. 1990, through Asworth 1996: 6.)

Physical deterioration is property-specific and largely predictable and, except for the most extreme cases, can be slowed down or reversed by capital expenditure. Conversely, obsolescence is unpredictable, can be more generalised and may be impossible to address. (Mansfield and Pinder 2008: 191)

As becomes evident also from Figures 20 and 21 and Table 29, depreciation deals with a gradual decline in the value of existing assets due to their aging. Unexpected obsolescence, on the other hand, generally reflects a sudden and sharp decline in the value of these assets that may result from events that do not affect real depreciation such as the introduction of new capital assets that are based on a superior technology. (Katz 2008: 3) The impact of accelerating technological change over the past few decades has been to shorten the useful life-span especially of many commercial buildings (Salway 1987: 118).

Table 29. Description of depreciation types during the life of a building.

Condition	Definition	Examples
Deterioration		
Physical	Deterioration beyond normal repair.	Structural decay of building components.
Obsolescence		
Technological[31]	Advances in science and engineering results in outdated buildings.	Office buildings unable to accommodate modern information and communication technology.
Functional	Original designed use of the building is no longer required.	Cotton mills converted into shopping centres; chapels converted into warehouses.
Economic	Cost objectives can be achieved in a better way.	Site value is worth more than the value of the current activities.
Social	Changes in the society's needs result in the lack of use for certain types of buildings.	Multi-storey apartment houses unsuitable for family accommodation.
Legal	Legislation resulting in the prohibitive use of buildings, unless major changes are introduced.	Asbestos materials, fire regulations.

Source: Ashworth 1996: 3.

Figure 22 exhibits the essence of four basic groups of the obsolescence of a building, i.e., structure, site, regulatory and aesthetic.

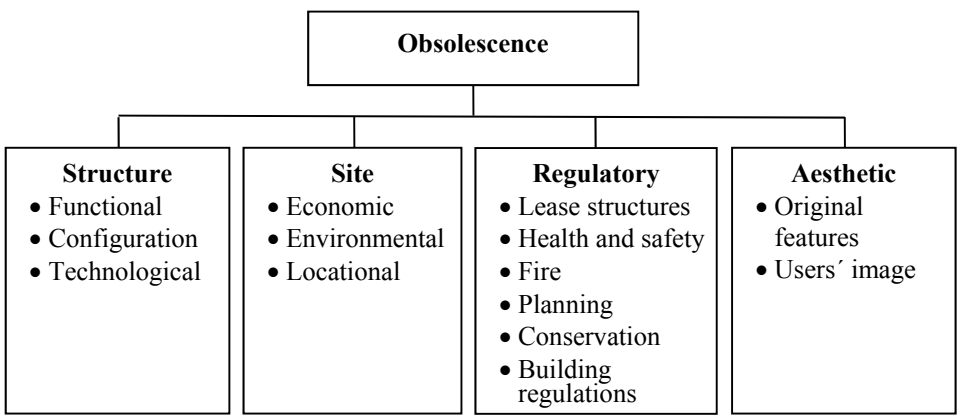


Figure 22. The generic grouping of building obsolescence (Source: adapted by the author from Mansfield 2000: 6, based on Baum 1991 and Khalid 1992.)

[31] By Feldstein *et al*. (1974: 394), technological obsolescence is defined also as the fall in the real resource cost per unit of output on new vintages of equipment.

In terms of forecasting, when weighing over the measurement methods of building depreciation, one should encounter with both the asset and its generated cash flow value of the real estate with their movements during the cash flow prediction period. From the value perspective, there exists a similar problem with state real estate and owner-occupied housing – i.e., both of them have user value and investment value, but it is difficult to distinguish these values from each other. One of the characteristics of the real estate market that describe the current state of the market condition from the value perspective is capitalization rate[32]. Knowing the capitalization rate, it is also possible to calculate the potential value of the asset and assess also the potential life cycle management costs via the depreciation allowances.

Capitalization rate is closely related also to other real estate based data, like (user) cost of capital and capital expenditure estimation, which in turn is also directly linked to the depreciation calculation theory. The next sub-chapter gives some in-depth insights into these characteristic features.

2.3.5. Modelling benefit and cost items in PREAM models

The following sub-chapter elaborates on the discussion over the problems concerning real estate market value and its modelling, and also on the discussion over market rent structure and its modelling during a planned forecasting period and beyond. The main emphasis is on the discussion over the cyclical nature of the real estate market value and market rent, over the difficulties to identify the structure of market rent and to deal with its long-term modelling in order to forecast a change in market rent. The main problems concerning market rent modelling or rent adjustment model are:

1) to identify, what are the inputs necessary for forecasting and modelling rent adjustment for a future change;
2) what kind of methodology to use in order to identify the market rent for various spaces for state real estate over the country at the beginning of the forecasting period; and
3) what are the components of the market rent (market rent structure)?

Also, the connection of market rent to user cost is elaborated on and discussed. This gives some insights into the possibilities of what may be the possible practices for solving the problem with rent structure.

Generally speaking, real estate leasing is a contractual arrangement between an owner and a user of property, which specifies the periodic rent, the term and numerous provisional clauses, including the provision for operating management and maintenance services. An important issue in leasing is the lessee's potential usage of the property, which is the lessee's private information (from the market point of view). Given asymmetric information with the respect to the

[32] Some authors (e.g., Hoesli and McGregor 2000) may reveal that real estate capitalization rates can be thought of as inverse price-earnings (P/E) ratios in finance. Although there may be some similarities, then still, some caution should be taken into account in such interpretation.

lessee's expected intensity of property utilization, the choice between a gross lease and net lease arises. In general, a gross lease is one in which the lessor pays all operating expenses, including utility expenses, property taxes, maintenance, and repair. In contrast, with a net lease, the lessee pays some or all of the operating expenses (called "level I net rent payment" in the Estonian real estate market practice). In real estate leasing practice, net and gross leases are both widely utilized, although usage varies across types of properties. (Mooradian *et al*. 2002: 293–294)

Within the current thesis, two main rent structures are discussed and further applied in the PREAM models. These are the market-based rent (MBR) structure and the cost-based rent (CBR) structure. In an equilibrium state of the market, both of these types of rental payments should be the same and there should not be any difference in what kind of rental structure is obtained by the public sector. In reality, though, cost-based and market-based rental structures are not equal. Although, the basis for their formation is the same – mainly user costs of the real estate owner, market rent may take into account real estate market influences and investor sentiments, which may not be that clearly identified.

There are two possible reasons for rental change (explanatory variables) (Hendershott *et al*. 2000):

1) deviation from the actual vacancy rate from the natural vacancy rate[33] (in USA);
2) drivers for the demand for space have dominated the estimation (in the UK).

Blank and Winnick (1953) were the first who introduced and suggested the basic rental adjustment model for rental housing. According to this model the percentage change in real rents is a linear function of the difference between the actual and natural vacancy rates (Hendershott *et al*. 2000) (see Formula 6):

$$(6)\quad \%\Delta R_t = \frac{R_t - R_{t-1}}{R_{t-1}} = \lambda\left(v^* - v_{t-1}\right),$$

where $\%\Delta R_t$ is the percentage change in rent level at period t, λ denotes the adjustment factor, v^* is the natural vacancy rate, and v_{t-1} is the lagged vacancy rate.

None of the conducted researches paid attention to the inner rent structure (rent components), which is highly important obstacle in modelling the rental structure in market-based PREAM models, especially for the modelling of the impact to government sector account in model 3 for general purpose property.

The explanation to the meaning of the essence of the inner rental structure may be given by the discussion about the user cost of capital, elaborated further in this sub-chapter. But the actual situation is reduced to the knowledge that

[33] The natural vacancy rate is defined as the long term vacancy rate characteristic for a certain real estate market segment and the actual vacancy rate is the current vacancy rate measured at the same real estate market segment.

without highly qualitative data, there is no real possibility to forecast the exact impact to GSA because of the fuzzy numbers.

As Jones (1993) denotes (via Nut and McLennan 2007: 38), then in most countries the government is the largest single occupier of office accommodation and uses a mix of freehold and leasehold property. Also, as a major occupier, any significant shift in the government's position could have a big impact to the real estate market, both in short- and long-run. As known to the author of this thesis, there is no research conducted so far that would investigate the influence of state actions on the real estate market in general, considering, for example, the impact of the disposal of state real estate and also large-scale SLB transactions with state real property. However, there are a number of papers (e.g., Trutwein *et al*. 2012; Leather and Nevin 2013; Stroebel and Floetotto 2010; Zhu 1997) that study the implications of government intervention in the real estate market in various countries through legislative actions (e.g., using changes in tax laws, offering credit guarantee schemes, cutting rates) in order to reduce negative economic effects to the market, especially on the recession of 2008–2010.

The question of real estate market price and rental price dynamics is highly related to the subject of real estate asset (building) depreciation, maintenance measurement, capital expenditures, and cost of capital. Figure 23 shows the explicit relation between depreciation, asset price, rental price, capital expenditure, and cost of capital, as identified by the author. These connections form the cornerstone for further empirical research of PREAM models in forecasting the 30-year cash flow of state real estate assets and their fiscal impact.

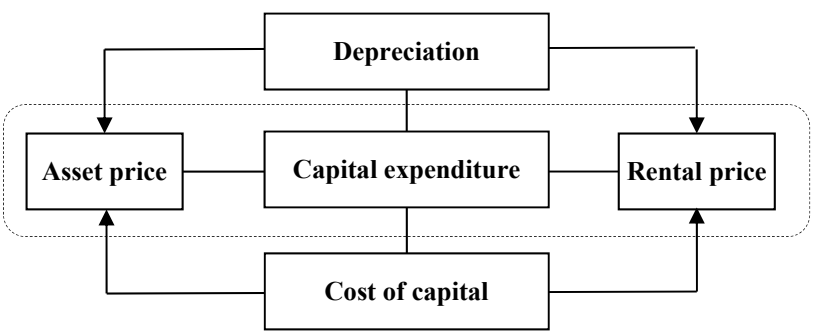


Figure 23. An explicit relation between depreciation, asset price, rental price, capital expenditure and cost of capital (Source: compiled by the author.)

Private commercial real estate market is complicated in many ways. From one aspect, real estate assets are decidedly heterogeneous, where no close substitutes exist either directly or indirectly, as the unique location and other attributes of commercial real estate assets severely restrict an investor's set of acceptable substitutes. Also, due to the real estate market illiquidity, high segmentation and inefficiency, the search costs associated with matching buyers and sellers are

significant. As on real estate market exists restrictions in short-selling, then limits to arbitrage could be expected to lead to deviations of prices from fundamental values in the presence of sentiment investors, causing mispricing. (Clayton, Ling and Naranjo 2009: 34) According to a connotation made by Grenadier (1996) – a log-normal distribution exists for both asset and rental prices, where there is a possibility for prices to grow by more than 100%, but they cannot drop more than 100% or below zero.

In normal cases, the current value (either market value or investment value) of the commercial real estate object (V_o) is derived by the discounted value of free cash flow from the real estate asset, which can be expressed by the following Formula 7:

$$(7)\ V_o = \sum_{t=1}^{n} \frac{\left[PGI_t(1 - vac_t) - OC_t - CAPEX_t\right]^t}{(1 + Y_o)^t} + \frac{\frac{\left[PGI_{n+1}(1 - vac_{n+1}) - OC_{n+1} - CAPEX_{n+1}\right]^{n+1}}{r_n} - CS}{(1 + Y_o)^n},$$

where PGI_t or PGI_{n+1} is potential gross income during the detailed forecasted period of cash flow either during period t or n+1; vac_t or vac_{n+1} is the expected vacancy rate of the real estate asset during period t or n+1; OC_t or OC_{n+1} is the expected operating cost during period t or n+1; $CAPEX_t$ or $CAPEX_{n+1}$ stands for the capital expenditures during period t; r_n denotes the expected capitalization rate at the end of the forecasted period of cash flow (often assumed to be lower than the current period's capitalization rate); Y_o is stated as the discount rate of cash flow directed to all investors of the real estate object (i.e., both the owner and the debt financer); CS is an abbreviation denoting the cost of (potential) sales of the real estate asset at the end of the forecasted cash flow period.

Rent plays a central role in the modelling of potential property market value. In equilibrium, there is a direct link between the user market of the real estate asset and the financial asset market, where the user cost of capital and capitalization rate meet in the assumable formation of an equilibrium rent. That kind of link is most notably expressed in a capitalization formula in real estate asset valuation, described also in a four-quadrant FDW real estate market model on Figure 16. The basis of the formula is shown in Formula 8:

$$(8)\ V_t = \frac{NOI_{t+1}}{r_t},$$

where V_t denotes the market or investment value of the commercial real estate object at period t, NOI_{t+1} is the net operating income from the commercial real estate object during period of t+1,and r_t is the market capitalization rate during period t or at the time of the value estimation.

In their study, based on 30 metropolitan US data sources from 1980 to 2009, Chervachidze and Wheaton (2013) noticed, that constant dollar rents[34] moved inversely with capitalization rates – when rates are high, then rents are

[34] In most of the researches, rents are used as a proxy to the net operating income (NOI), as the latter is more building-specific and needs more precise data for calculating.

low. This led the researchers to conclude that the markets inefficiently price current conditions and are not forward-looking.[35] For the estimation of capitalization rate, it is good to know the basics of the factors that affect general market capitalization rates. These are (Chervachidze and Wheaton 2013):

1) risk free treasury rates (T-rates);
2) macroeconomic factors, i.e.:
   a. general macroeconomic capital flow;
   b. the availability of debt;
3) local market fundamentals, i.e.:
   c. the general corporate risk premium operating in the economy;
   d. the amount of debt relative to GDP in the general economy (liquidity);

Taking into account the number and variety of different real estate objects within the set of public sector real estate, it would be impossible to follow Formula 7 or 8 in detailed form at the current state, due to the lack of adequate input data. Instead, the adjusted cash flow formula for each of the PREAM models is developed (e.g., the rate of vacancy is ignored in total in terms of public sector buildings). These are introduced in detail in the empirical part of the thesis.

The concept of user cost of capital, which connects the user (or space) market, the financial market, and the capital market (see also Ball *et al*. 1998: 151–152), is introduced in the following part of the thesis.

Capitalization rate as the user cost of capital

User cost has been discussed over already since 1936, when J. M. Keynes published his book "The General Theory of Employment, Interest, and Money". After that, scholars have thoroughly discussed the concept, and today, the Keynsian "user cost" is known also as "the opportunity cost of capital", which refers also to the connection to the discount rate, as it is known nowadays. Within the present thesis, the concept of user cost is important because it is most effectively in explaining the relationship between the asset price, its rental price and the asset's depreciation. It is especially important in case of real estate assets, as the value of this type of assets is remarkably high and any kind of change in the three mentioned constituent parts of it may cause considerable financial effects. Therefore, the user cost of capital explains the internal validation of cost formation related to capital expenditure as a major cost item for a state, derived from real estate assets.

By definition known by now, user cost of capital is a cost of owning and using a capital asset. Capital asset in principle is an asset that maintains value over time, as it is well observable among buildings. The user cost of using or the user cost of owning a unit of real estate (or building) in a given period is defined similarly to user cost of capital from the neo-classical theory of investment (see Poterba 1984, also Diaz *et al*. 2003).

[35] This argument is taken into account within the empirical part of the dissertation in modelling the expected income from the disposition of state-owned buildings.

As it already covered, the concept of user cost of capital in the context of the present thesis is central in many ways. Firstly, it is shown, how the user cost of capital is connected to the level and formation of real estate market price and also market rental price, being affected largely by the term "structure of leases". Secondly, it is discussed, how the user cost of capital may or may not help to model relevant input data, especially concerning market rental data in PREAM models.

Most researchers seem to agree in general with the original statement made by Hall and Jorgenson (1967) that the user cost consists of a required rate of return on capital[36], the depreciation rate, an asset revaluation term, and an adjustment for the tax treatment of capital assets (see Hill and Syed 2011, Inklaar 2010, Hill 2011, Diewert and Nakamura 2009, Garner and Verbrugge 2009, Diaz and Luengo-Prado 2008, Himmelberg, Mayer and Sinai 2005, Blackley and Follain 1995, Chow and Wong 2003). Formula 9 conveys the typical mathematical expression of the possible components of the user cost of capital within the academic literature:

$$(9) \quad u_t = rf_t + \omega_t + \delta_t - g_{t+1} + \gamma_t,$$

where u_t is denoted as a fraction (percentage) of user cost as a user cost of capital, rf_t is risk free interest rate, ω_t represents property tax rate, δ_t is depreciation rate for the building, g_t is expected capital gain for the next period, γ_t is risk premium of owning the building as opposed to renting.

Diewert and Nakamura (2009) found that the full *ex ante* user cost consists of the sum of normal maintenance expenditures of the building property taxes, depreciation expenses of the building (i.e., loss of the value of the real estate unit due to the effects of aging and wear and tear that is not offset by normal maintenance expenditures)[37], and waiting costs (i.e., the costs of foregone interest due to the funds being tied up in owned dwellings), subtracted by the anticipated capital gains or losses caused by the real estate market specific inflation over the given time period. The full *ex post* user cost is defined the same way except that *ex post* (i.e., actual) capital gains or losses are used in place of *ex ante* anticipated gains or losses (*Ibid.*: 11). Therefore, it could be argued that user cost is in part opportunity cost[38] (the foregone after-tax return of real estate on alternative assets), in part out-of-pocket expenses (mortgage interest payments, maintenance costs, local real estate taxes, and other similar kind of expences) and in part value variation (depreciation and capital losses associated to real estate price fluctuations) (Diaz and Luengo-Prado 2003: 2).

According to the essence of user cost of capital, it can be regarded the same as the overall capitalization rate, known from the real estate valuation theory.

[36] More specifically said – the rate of return on the best alternative investment (Katz 2009).

[37] If a real estate unit is remodelled or extensive maintenance expenditures have been undertaken, then new investment has been added to the unit and the proper accounting treatment becomes more complex.

[38] For a real estate owner, the user cost of capital is an opportunity cost, as the owner can sell the property.

When applying the user cost concept to the Estonian market, then in terms of the Estonian tax system, only land tax, instead of whole property tax, should be considered. Also, in certain types of calculations, the income tax part of user cost should be ignored in terms of the Estonian tax system.

The simple frictionless theory models imply that a building's rental price will equal its user cost (Garner and Verbrugge 2009) and therefore, in equilibrium, the user cost of capital is equal to the rental price of capital (see Hill 2011 and Hill and Syed 2011). The latter statement is specified by Chow and Wong (2003: 12), claiming that in equilibrium, the user cost should equal the after-tax rental income, as it is seen in Formula 10:

$$(10) \quad uc = R(1-t)(1-\alpha),$$

where uc denotes the user cost in monetary terms, R is the rental price, t is the tax rate and α indicates the standard deduction rate on rental income.

All in all, the link between user cost and rent depends on the structure of the rental market (Alm and Follain 1994). From there, one of the important theoretical problems is the identification of the link between user costs, rental price, and real estate value (see also Figure 24). Taking from there, one of the still empirically observed research problems has been the adjustment process among user costs, rental price and real estate price (or real estate market value). According to the opinion of Cheung *et al*. (1995), changes in real estate market value lead to changes in rental price, meaning that by nature these two markets (i.e., asset market *versus* space market) are substitutes to each other. The problem about the completeness and speed with which rental price responds to changes in user costs, has still not been understood completely. So far, Alm and Follain (1994) and Blackley and Follain (1996) found that only about half of any increase in user costs is ultimately passed along a higher rent and the adjustment speed is extremely slow.

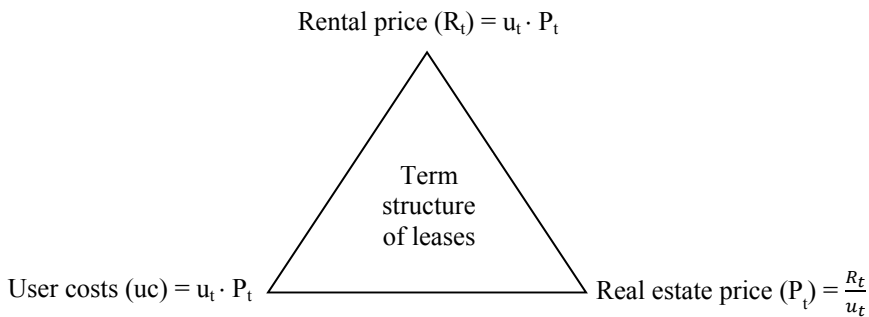


Figure 24. The link between user cost, rental price and real estate price (Source: elaborated by the author.)

When the user cost of owner occupied real estate is lower than the rental price of real estate services, the preference would be to purchase the real estate instead of renting it, and wealth (liquidity) constraints are likely to be the main deterrence from the real estate ownership. When the real interest rate is low, the ownership of the property is relatively attractive, because of the lower mortgage payments and low-yield alternative investments. (That kind of situation holds true on the current real estate market, i.e., at the beginning of 2013.) In summary, if $R_t > u_t \cdot P_t$ holds, then the ownership of real estate (i.e., owner-occupying) becomes more attractive than renting. Price-to-rent ratio (P_t/R_t) should equal the reciprocal of the user cost ($1/u_t$), i.e. $P_t/R_t = 1/u_t$.

The term structure of lease concept must explain why the optimal holding period is five years, applied in PREAM model 4, while leasing the real estate space via a SLB transaction from the private sector.

Modelling the expected market rent

From the public sector point of view, it is possible to apply two types of rent payments, i.e., cost-based and market-based rent. In practice, cost-based rent is applied to special-purpose properties and market-based rent is applied to general-purpose properties. While the cost-based rent estimation is relatively straight-forward, market rent estimation and modelling in longer-term perspective would be rather challenging in volatile real estate market conditions.

The modelling of both the real estate market value and the market rent are essential in order to forecast benefits and costs from the PREAM models in the long-term, and therefore it is important to understand the essence of the cyclical nature of the real estate market. I.e., the understanding of the basis of the real estate market cycle mechanism can have some implications on the modelling of real estate market value and market rent, which are both important input data in assessing cash flow in PREAM models 3 and 4.

A strong mean reversion of prices has been noticed, especially in the commercial real estate market, that translates into one of the more important characteristics of the real estate market – a negative feedback loop, i.e., the market is constantly looking for a balance.

According to the author's opinion, the possible components of market rent are illustratively presented on Figure 25.

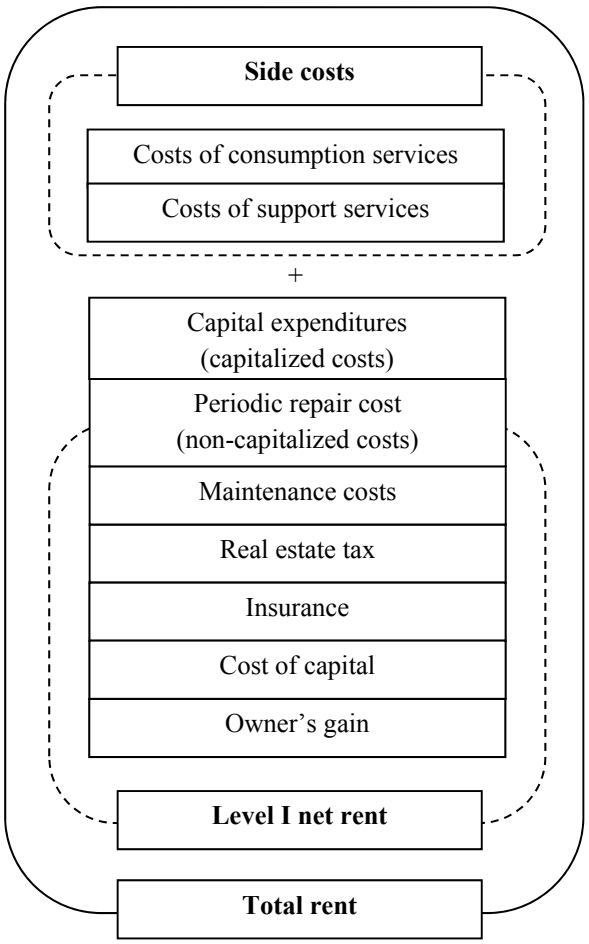


Figure 25. The hypothetical components of market rent (Source: compiled by the author.)

Expressed by Formula 11, the rental price (R) is a function of capital expenditures (c), maintenance costs (m), real estate taxes (t), insurance (i), cost of capital (k), and owner's gain of the real estate asset (g):

(11) $R = f(c, m, t, i, k, g)$.

As denoted earlier, in terms of real estate market equilibrium, rental price should equal user cost of capital, i.e., $R_t = u_t$.

Typical contractual rent structure for the Estonian real estate market is a rent that is collected or formed on the level I net rent, as it shown also on Figure 25 with detailed view on hypothetical rent components. The problems with these rent components are that, firstly, no such empirical research that identifies in detail the existence, size and content of these components in the market has been carried out; and secondly, it can be intuitively assumed that all these

hypothetical components have possibly different expected growth rates, which are so far empirically non-observed in the market throughout a long time-frame. Even if there are certain kinds of data sets from the past, it is practically impossible to forecast the pattern of these components for the future.

While in normal cases in the private sector it would not be important to deal with that kind of information, it is extremely important in the context of the current thesis to attempt forecasting cash flow for a 30-year period for the government sector account. The main reason is that it is almost impossible to forecast the costs for the government sector in a correct way without knowing which components from the rental price paid to RKAS are staying within the government sector and what kind of components are going out of the government sector. On the other hand, as the problem is practically impossible to solve without any major lags in the forecast, then the possible solution remains out of reach of the current thesis.

Modelling discount rate

Based on the theoretical approach developed in sub-chapter 1.4.3, the link between the classifications, methodological findings of discount rate measurements, and their application in practice in terms of the PREAM models (analysed in the empirical part of the thesis) is given on Figure 26.

As illustrated on Figure 26 and according to the theory and the best practices so far, it would be best to calculate the discount rate for PREAM models 1 and 2, using a financial approach, i.e., using the rate of borrowing cost to the government for the assessment of the present value to the cash flow forecasts. On the other hand, for PREAM models 3 and 4 it would be appropriate to use the social approach in deriving the discount rates, i.e., using rate of return on private investment or market-determined rates for the assessment of the present value of the cash flow forecast. In reality, taken into account the essence of the PREAM models' cash flow (all cash flow is on the level of the government account) and assumptions taken in the empirical part of the thesis (all the models assume that investments are made only from equity capital and no loan financing is used), then the only way for choosing the appropriate discount rate, is to use the financial approach and derive the discount rate from the potential borrowing rate of the government.

There are several theoretical arguments for choosing the appropriate discount rate for discounting future public sector cost and benefits. For example, researches carried out in the private sector reveal that many shorter lease agreements reflect a higher discount rate compared to long-term lease agreements where the anchor lessee is a company with a good covenant. This is only a one aspect that should be taken account in weighing over the appropriate discount rate. Most probably, from the private investors' point of view, the state can be viewed similarly to a high-graded private company.

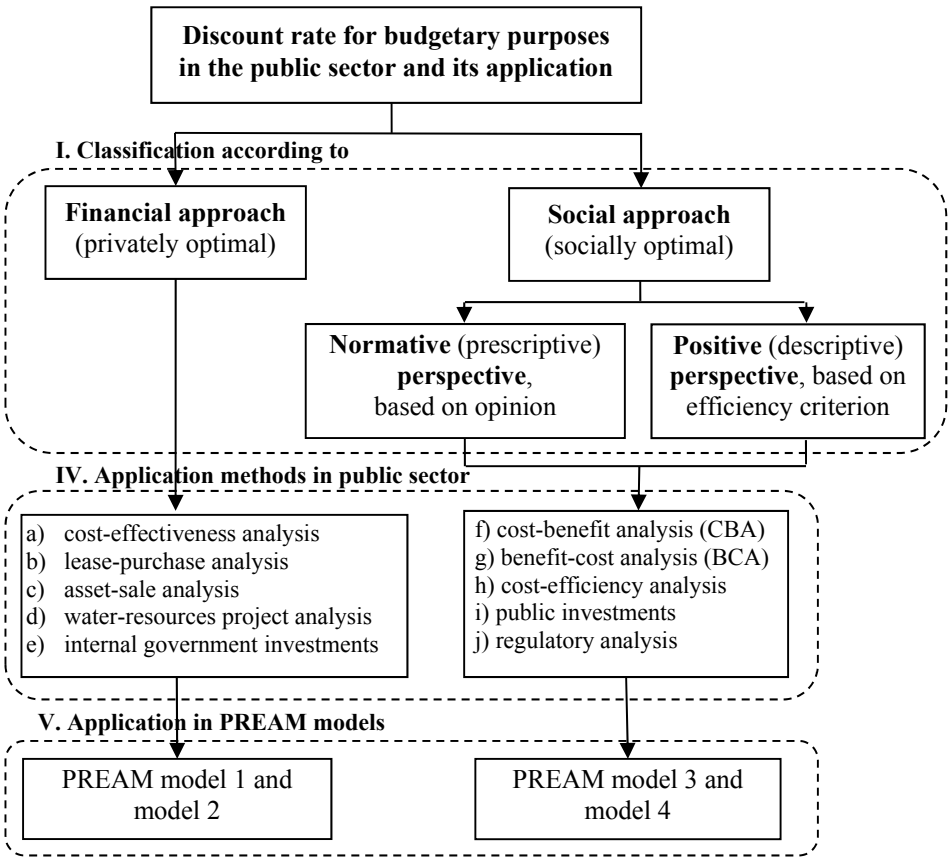


Figure 26. The application of the discount rate by the public sector in practice and in the PREAM models (Source: elaborated by the author, based on the literature and Kask 2014: 116.)

In its most recent Green Book (2011), the UK Treasury recommends that public sector economic appraisals discount future benefits and costs at a real rate of 3.5% per annum in real terms. This 3.5% figure represents an empirical estimate by the Treasury of the social time preference rate (STPR). (Paulden 2010) However, Paulden (2010: 1) shows in his research that the empirical basis of this 3.5% estimate is flawed and argues that the Treasury's choice of estimates has had the effect of exaggerating the discount rate.

According to Weitzman (1998), social discount rate should be falling over time because of its uncertainty compounds. The same idea has been followed in the Green Book (2011), which suggests using a differentiated structure of discount rates for different time horizons, according to a predetermined schedule (see Table 30).

Table 30. Suggested discount rates in practice for long-term public sector projects.

Period in years	0–30	31–75	76–125	126–200	201–300	301–…
Discount rate	3.5%	3.0%	2.5%	2.0%	1.5%	1%

Source: The Green Book 2011: 99.

Typically, social rate of time preference is lower than social opportunity cost. In practice, social rate of time preference is often equalled with government bond yields. In the USA, the Government Accountability Office suggests using a very low discount rate (about zero in case of real interest rate) when dealing with projects with large intergenerational effects involving human life (Kohyama 2006: 17).

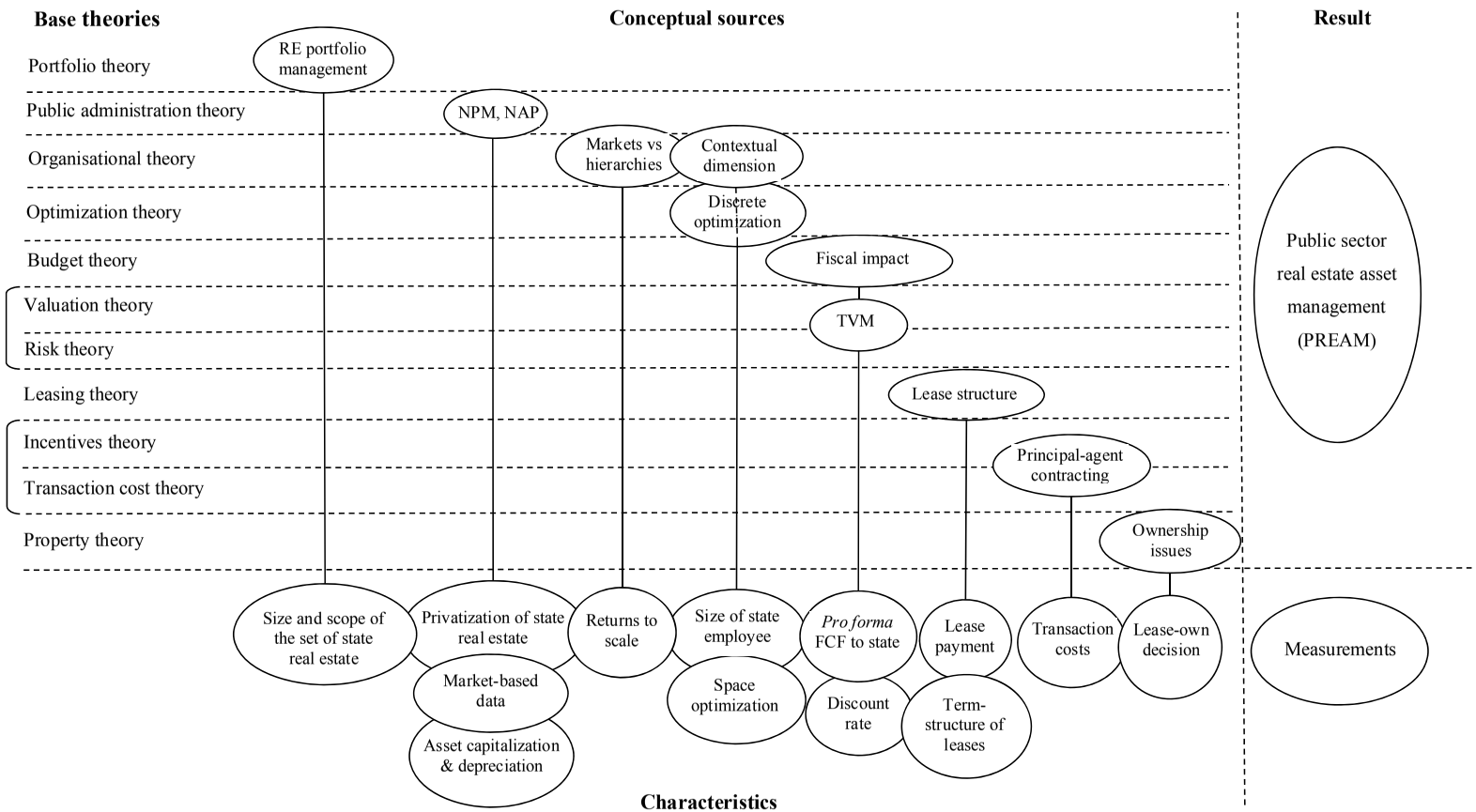
Krishnaswamy *et al*. (1994) argue that possible agency costs are much higher in public enterprises compared to private ones, mainly because there is an extreme ownership and control separation in public organisations, and that is why a higher discount rate should be used in case of government projects. Some scholars (see e.g., Sandmo and Dreze 1971) have proposed an idea that in case of government projects, discount rate should be calculated as the arithmetical average of financial and social approaches, where the weights should reflect the proportions in which public investment decreases private investments and consumption.

Also, the shadow price approach (see e.g., Bradford 1975) has been suggested, which helps to avoid dilemma occurring because of the differences in social opportunity cost and social rate of time preference values. Unfortunately, the named approach is highly sensitive to technical presumptions and includes subjective assessments (Mendelsohn 1981).

After analysing the practice of a number of US government institutions and previous theoretical approaches, Kohyama (2006) concluded that there can be no single discount rate for discounting government cash flow. Theoretically it would be correct to choose such a discount rate that takes into account the risk level and cash flow timing.

2.4. Conceptual framework for the measurements in PREAM models

Based on the theoretical concept elaborated on in Chapter 1 and the discussion over the measurements applied to PREAM models, an extended figure has been developed of the conceptual framework of PREAM to give an overview of the measurements that are used in the empirical part of the thesis, where PREAM models are evaluated (see Figure 27). Figure 27 integrates the theoretical part of the thesis (see Chapter 1) with the findings of the methodological part (see Chapter 2). The figure does not take into account the final set of measurements within the concept of PREAM, but the most relevant ones, that can be drawn directly from the particular theory.



Note: RE – real estate; NPM – New Public Management; NAP – New Accounting Principles; TVM – time value of money; FCF – free cash flow.

Figure 27. Conceptual framework of public sector real estate asset management (PREAM) and its measurements (Source: compiled by the author.)

In the current thesis, portfolio theory is taken into account only in an indirect way, in the context, where the size and the scope of a set of public sector real estate are evaluated. According to the public administration theory, taking account the concepts of NPM and NAP, the privatization of public sector real estate is decided upon, where market-based data are also used as a newly applied approach in public sector management. Also, only after the adoption of NPM and NAP, privatization issues, asset capitalization and amortization were adopted in public sector real estate administration and management. Therefore, the present thesis considers them to be an important part in the formation of a collection of PREAM measurements.

As the management of real estate is carried out by state institutions, then the dilemma between markets and hierarchies has to be considered on the level of organisational theory, which determines the centralized or decentralized approach to PREAM. Two important measurements in the PREAM context derive from the contextual dimension of the organisational theory are – the number of state employees and the amount of space used by these employees. Both measurements are taken account in an optimized way, according to the discrete optimization theory, in order to lessen the fiscal impact to the SB and GSA.

The measurements concerning optimization theory are derived from the budget theory, which in combination with the valuation and risk theory will form the core issues for the measurement of *pro forma* free cash flow to the public sector. That in turn leads also to a very complicated problem – the measurement of the appropriate discount rate, applied to the same cash flow. By all means, the appropriate discount rate would be a necessary measurement for the adequate comparison of the different PREAM models.

In addition, as since the adoption of NPM there has been a lot of discussion over the privatization issues of public sector real estate assets, then a vast set of measurements have been connected to the leasing of public sector real estate assets. As the property theory determines the decisions over the leasing and ownership of the asset, then, for example, the leasing theory determines the basis of the lease structure of public sector real estate assets, measured by the term structure of leases and lease payment either to the private sector or to the state-owned enterprise. Also, taking into account the incentives theory and transaction cost theory, usually the principle-agent contracting must be under-taken. That in turn generates some transaction costs.

3. EMPIRICAL STUDY

3.1. Main principles of PREAM and description of the dataset of public sector real estate assets in Estonia

The empirical part of this research faces with the question of how to implement the methodology developed in the second chapter of the paper. Among other things, there are three major problems that need to be solved:

1) how to implement the growth of costs and benefits during the 30-year and beyond cash flow period;
2) how to solve the problem of capital expenditures to the set of Estonian state buildings;
3) how to handle the problem of real estate disposition in PREAM model 4, i.e., disposition strategy in general, the estimation of the potential size of the benefits, possible length of the selling period of assets?

At first, a short overview of the PREAM situation in Estonia is described.

Estonia launched its own guidelines for public sector real estate strategy in 2007. (Riigi… 2007) Since then, remarkable work has been done to establish the four primary strategic goals that were set up in the named strategic document. A short description of the steps taken so far is given in Figure 28.

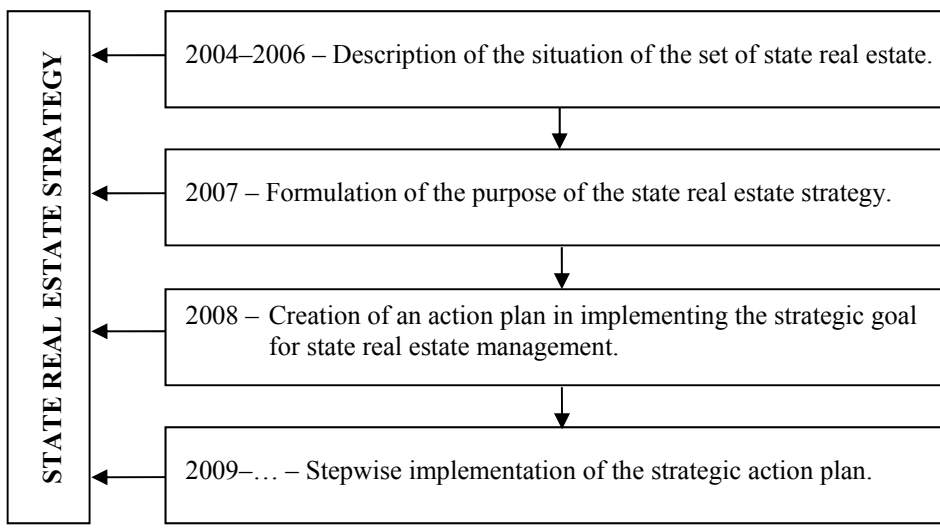


Figure 28. A timeline of formation of the state real estate strategy in Estonia (Source: compiled by the author.)

Table 31 describes the general development of public sector real estate management issues in Estonia, since 1990 up to now.

Table 31. Actual issues in Estonian property market at different stages of development.

DOMINATING PERSPECTIVE		Actual issues	Time	Stage of management
	Market	Formulation of strategy	since 1990	Property management (PM)
		Sale of surplus		
		Outsourcing		
		Formal (RE) valuation		
	Operational	Information system	since 2000	Portfolio management (PfM)
		Performance measurement – cost		
		Internal rent implementation – cost concern		
		Reformulation of strategy		
	Financial	Performance measurement – return concern	since 2010	Corporate real estate management (CREM)
		Strategic (RE) valuation		
		Disposal for sale and leaseback		
		Reformulation of strategy		

Source: Ilsjan 2006: 41.

In its official state real estate strategy, published in 2007, the Estonian government set up clear guidelines for government real estate asset management for the following years (Riigi … 2007). The summarised concept of the state real estate strategy is to transfer the whole set of state buildings to the balance sheet of state-owned real estate company, Riigi Kinnisvara AS (*State Real Estate Ltd*, RKAS). After the transfer RKAS will stay the owner and the manager of the set of special-purpose property and the organiser and preparer of the set of general-purpose properties for the disposal to the private sector; i.e.; the main strategy is to sell the whole set of general purpose buildings to private investors and to transfer all special purpose buildings (except those which cannot be dispossessed) under the administration of RKAS. The exact net surface area of buildings to be sold has not been determined, but according to the Ministry of Finance expertise in 2010 the figure was approximately 524 thousand square meters (Riigi… 2010). This means that for special purpose property, model 3 is the strategic choice for Estonian government and for general purpose property, model 4 has been taken as the main target model. Although the strategic decision was taken already in advance, the question about the rationality of those decisions still holds.

As by now and also in the future, RKAS plays an important role in the Estonian public sector real estate reform. Therefore, a short description of the company is of place. RKAS is a company, whose common stocks belong 100% to the Republic of Estonia. The company was established in 2001 by the government of Estonia with the aim to offer a real estate development and

management service to Estonian government institutions in a centralized and more efficient way. The amount of the common stock is EUR 166.7 million (in 2013) and the holder of the stock portfolio is the Ministry of Finance of Estonia. Since 2011 the company has invested into public sector real estate assets *ca* EUR 65 million per year. As a public institutional unit, RKAS belongs to the government sector and therefore, all investments made through RKAS have a direct fiscal impact to the state budget. The state has put an obligation on RKAS to earn at least 7% of return on equity (ROE) per year.

As the Table 32 shows, then the number of immovable property and buildings on the RKAS balance sheet has grown gradually over the years. The final goal for the government in Estonia, according to the public sector real estate strategy, is to give over all state real estate assets under the ownership and management of RKAS.

Table 32. Changes in the set of RKAS assets during 2007–2012.

Date	Number of immovables	Area of immovables (m^2)	Number of buildings	Net enclosed area of buildings (m^2)
31.12.2007	139	3 373 080	166	424 700
31.12.2008	166	3 650 330	195	428 846
31.12.2009	182	3 948 608	237	422 029
31.12.2010	300	5 882 169	406	450 555
31.12.2011	372	4 878 484	545	565 726
31.12.2012	722	12 209 893	1 051	896 791
31.12.2013	706	14 673 661	1 061	969 804

Source: Consolidated Group Annual Reports of RKAS, 2007–2013.

This means that – for special-purpose property, the chosen model to implement is model 3 (centralization model) and for general-purpose property, the most appropriate model is model 4 (privatization model). That kind of position has been taken since 2007, when the official strategic document concerning Estonian public sector real estate policy was adopted.

The analysis period of the present thesis started at the beginning of 2011, when there were 406 buildings on RKAS balance sheet (by now, there are approximately 1000 state buildings, as is seen from Table 32). The number of state buildings held by RKAS has been gradually increasing due to the implementation of the state real estate strategy. By the present time, most of the state ministries out of a total of eleven have been given both the ownership and management of their real estate assets over to RKAS. The first ones were the Ministry of Finance and the Ministry of Education. On the other hand, in case of the Ministry of Defence, there are still many problems to be solved and most probably – because state defence risks being too high – some of the real estate

assets will never be given over to RKAS and remain under the ownership and management of the Ministry of Defence.

At the beginning of year 2013 approximately 800 people were accounted to deal with public sector real estate in Estonia. The amount of the budgetary money they manage accounts to around EUR 250 million per year. (Ministry of Finance, Riigi Kinnisvararegister 2013)

The empirical analysis of the current thesis is based on the description of the situation and data obtained from the public sector buildings' inventory at the end of 2009 and also on the data gathered from market experts[39], i.e., based on an expert opinion. Table 33 summarises the sources of data and their collection method, used within this dissertation.

Table 33. Sources of data by their collection methods.

Method	Data source
Indirect	• Economic macro-data forecasts • Real estate market data from various databases • Ministry of Finance database (public sector buildings' space data, based on the asset inventory in Estonia during Autumn 2009) • Database of State Real Estate Ltd (RKAS) (i.e., micro-data) • Benchmarks (from professional standards and the literature on best practices) • Estimations by real estate market experts
Direct	• Semi-structured interviews (see Appendix 1) with real estate managers of Estonian ministries and other real estate specialists in the market

Source: compiled by the author.

The following sub-chapter summarises the results obtained by the inventory of the set of state buildings in Estonia, conducted by Estonian Ministry of Finance in fall 2009. These data were specified and corrected afterwards for the current study.

The implementation of the real estate asset inventory was one of the main steps taken by the Estonian government in order to take real actions to start the reforms in the management of public sector real estate assets. According to the stated plans of the government, the planned starting point was to start with the state real estate reforms at first from the level of state or general government real estate and to move thereafter step-by-step further, also to the level of local government, until the whole public sector is incorporated (public legal persons, like universities, included). The main body of the empirical analysis presented within the current thesis is formed considering the updated results (based on the data from the beginning of 2011) from the set of Estonian public sector real estate assets, or more precisely, from the central government buildings' inventory.

[39] The main real estate market experts were two certified appraisers from AS Kinnisvaraekspert – Aivar Tomson (MRICS) from Tallinn (covering the northen part of Estonian real estate market) and Eduard Elbrecht from Tartu (covering the southern part of Estonian real estate market).

Appendix 2 summarises the volume of space data of the state real estate assets in square meters at the beginning of 2011. According to the results of the inventory, the whole space capacity of the set of the Estonian central government buildings (owned or leased) at the beginning of 2011 was 2.52 million m^2 in terms of useful space, from where 0.22 million m^2 were regarded as surplus property, leaving approximately 2.3 million m^2 of space free for the analysis with PREAM models.

As it will be seen in the following chapters, the quality of the data for the analysis available is the utmost crucial aspects in proper decision-making. Therefore, it is pleasant to know that by the present day, the Estonian government has created and launched a new innovative centralised registry of public assets on state level in order to keep a record of public assets. It is a universal public sector real estate database and information system that has been in use since fall 2012 and is based on a new IT platform for the data registry of public sector real estate assets. Being still in its development phase, the final goal is to unite the public sector data registry with the public sector accounting system in order to simplify the process of public sector budgeting. One important factor in this data collection process is the classification of state buildings or properties as general purpose property and special purpose property, being viewed as separate sets of assets.

3.2. General assumptions and stylised schemes of PREAM models

3.2.1. General assumptions made on PREAM models

The methodological part of the thesis shows that it is possible to develop several different kinds of theoretical PREAM models, based both on the literature and on the best practices taken from countries with more advanced experiences in public sector real estate management. The empirical part of the thesis aims to analyse and test the practical implementation of the previously constructed four PREAM models, based on the set of Estonian state buildings. But beforehand, to construct a reliable model, some necessary assumptions should be made.

The life span of a state and its spending is considered to be perpetual. On the other hand, the life span of buildings is considered to be either long-term or perpetual. Therefore, it is important to construct that kind of cash flow models for PREAM that describe the long-term life pattern of both the state and the buildings from the best perspective. Hereby, some of the most important, but though generalised, assumptions and aspects have been described about the construction of the empirical PREAM models.

Firstly, in order to express the long-term impact of government spending, a detailed 30-year cash flow forecast to the state budget and the government sector has been used and analysed; and thereafter the perpetual terminal cash flow is assumed. The main reason why that kind of approach has been chosen is primarily because of the long-term life span of buildings. In choosing the

appropriate length of the detailed cash flow forecast, the general opinion about the economic life of the buildings, ascertained by different researches, indicated in sub-chapter 2.3.4, has also been considered. Principally, economic life has been derived from the average opinion about the depreciation rate of the buildings, which is 3%. The same rate is used later in determining the capital expenditures as the main maintenance cost for the buildings. In addition, as suggested by several researches (e.g., Mertens and Rubinchik 2012; Rambaud and Torrecillas 2006; Bayer and Cansier 1998), the perpetual cash flow has been chosen in order to indicate the inter-generational approach to the problem.

Several assumptions and clauses have been taken into account when compiling the structure and the cash flow pattern for the PREAM models handled in the current thesis. These assumptions and clauses are the following:

1. No social benefits and social costs of state activities have been considered, only directly accountable costs and benefits from state real estate activities.
2. The taxation principles in Estonia remain unchanged during the cash flow forecasting period, i.e., forever.
3. All the input data have been taken into account as free of VAT.
4. The functions of the central government remain unchanged, i.e., there will be no change or transformation of tasks between central and local government.
5. Considering both general-purpose property and special-purpose property, the purpose in use does not change during the whole forecasted cash flow period; and the development of new spaces is excluded from the modelling.
6. All the forecasted data are set up according to the best knowledge of the author, based on the available databases and the suggestions of the real estate market specialists and practitioners in Estonia.
7. All cash flow to the state budget and the government sector (during the years n to n+30) are assumed to emerge at the end of the year.
8. In the assessments of all the input data the characteristic features of the set of state real estate (including condition, location) and the real estate market based factors have been taken into account, considering also reliable forecasts of both macroeconomic and real estate market data.
9. In order to achieve the comparability of the PREAM models, it is additionally assumed that:
    a. The space capacity (in square meters, m^2) used within and across the models are similar;
    b. The capital investment expenditures are the same across the models during the 30-years forecast;
    c. The source of financing is the same (i.e., state budget) across the models.
10. Considering special-purpose property, a cost-based approach has been applied in all models. For general-purpose property, in models 1 and 2, a cost-based approach has been applied; whereas, in models 3 and 4 a market-based approach is used.

11. In case of model 3 it is assumed that the state is a sole owner of RKAS in perpetuity.
12. In conjunction with the disposal of assets in model 4, it is additionally assumed that:
    a. The state leases the existing space for the whole forecasted cash flow period (the removal to another space is excluded);
    b. In case the owner of the asset is either a private investor or RKAS, the tenant of the space is always chosen to be the state;
    c. No maintenance costs are assumed among the potentially disposable assets (i.e., residual space in the set of disposable real estate assets) during the 5-year forecasted selling period, being transferred to the ownership of RKAS.
13. RKAS has limited opportunities in offering the supply of lease space to the market because of its in-house regulation, which states that only 10% of the revenue may accrue from the private sector and the only alternative is the disposal of public sector surplus assets to private investors.
14. Although, all the input data concerning RKAS procurement are submitted without the profit share of RKAS, still the structure of the models assume by default the consistency of RKAS's share of income.

In addition to the above-mentioned assumptions, separate assumptions have been made about every single input-data, the description of which has been brought in the following chapters. The primary intention of the analysis is to achieve maximum disengagement of public entities/government agencies from real estate activities in order to reduce the direct real estate related costs to the state budget (including the possible optimization).

Within the empirical part, the evaluation of the four PREAM models has been executed. In short, the models can be described as follows:

– Model 1 is the base model or "as it is" model, where the owner, manager and financer of public sector real estate assets is the state. The model assumes a passive way of real estate asset management, where no returns to scale and no space optimization are used.
– Model 2 is the modification of the base-model.
– Model 3 is the basic centralization model.
– Model 4 is the privatization model.

Both, model 3 and model 4 bring about a problem concerning the real estate market price and market rent cyclicality (and volatility), which are important issues in the long-term forecasting modelling of cash flow. All PREAM models consider two types of dependent variables:

1) cash flow to SB on yearly basis, during the 30-year forecast;
2) cash flow to GSA on a yearly basis, during the 30-year forecast period.

Although, the independent variables differ according to the model, the purpose, and the level of cash flow, a general overview about the empirical benefit and cost items in PREAM models has been given in Table 34.

Table 34. The main benefit and cost items in PREAM models.

Type of item	Type of item variable
Benefit items	• Sales revenue from asset disposition resulting from – space optimization, i.e., disposal of surplus property – privatization
Cost items	• Maintenance costs • Periodical repair costs • Capital expenditures • Rental payments (both cost- and market-based rent structure) • Costs of sales • Cost of capital

Source: compiled by the author.

On the other hand, table 35 summarises more specifically the most important independent variables used in calculating the long-term cash flow for direct fiscal impact analysis of PREAM models. The detailed description of these variables is given further, in the following sub-chapters.

Table 35. Independent variables according to the model and the purpose of cash flow (CF); i.e., state budget (SB) and government sector account (GSA), respectively.

Dependent variable	Independent variables			
	Model 1	**Model 2**	**Model 3**	**Model 4**
CF to SB	• Maintenance costs • Periodical repair costs • Capital expenditures	• Maintenance costs • Periodical repair costs • Capital expenditures • Net income rate • Dividend rate	• Market-based or cost-based rent • Net income rate • Dividend rate • Sales revenue from optimization • Cost of sales • Equity rate of return of RKAS	• Sales revenue • Cost of sales • Net income rate • Dividend rate • Management costs of RKAS • Market-based rent
CF to GSA	• Maintenance costs • Periodical repair costs • Capital expenditures	• Maintenance costs • Periodical repair costs • Capital expenditures • Cash flow rate	• Sales revenue from optimization • Costs of sales • Periodical repair costs • Maintenance costs • Cash flow rate • Capital expenditures of RKAS	• Sales revenue cost of sales • Management costs of RKAS • Market-based rent • Cash flow rate
	• Opportunity cost of capital for GSA			

Source: compiled by the author.

The empirical research with the PREAM models has been implemented, using a twofold approach. At first, the so-called base-level research was carried out based on the business finance approach, and thereafter, on the second level, the possibilities to find some transmission mechanisms on the public sector finance

level were explored (see also Figure 29). From the business finance approach, the use of a cash flow based analysis method was taken as the basic generalised starting point (i.e., primary-level impact). Here, for every PREAM model, a 30-year cash flow forecast was drawn up based on the BCA method. The cash flow forecast was calculated separately for general-purpose property (GPP) and for special-purpose property (SPP). From there, the compiled cash flow forecast (based on benefit-cost input data) was generated into the 30-year (FI) to state budget (SB) and government sector account (GSA) (see Figure 29), where the latter was discounted with the appropriate risk-adjusted discount rate (i.e., secondary-level impact). The final result for the comparison of the PREAM models was the discounted cash flow (DCF) to the present value. The empirical cash flow based analysis of the four PREAM models was executed, using MS Excel software.

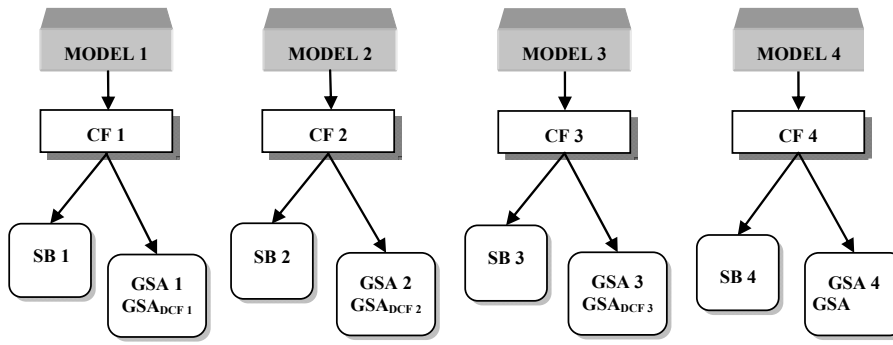


Figure 29. Structured overview of the derivation of the first-level cash flow (CF) and fiscal impacts (FI) of PREAM models (Source: compiled by the author.)

In the following, a short description of the theoretical background and the logical structure of the PREAM models (model 1, model 2, model 3 and model 4, respectively) are given. In the next sub-chapter, additionally a stylised scheme of each of the PREAM models (see figures 30–34) is brought out. In these schemes the impact on SB and GSA has been drawn out over the 30-year forecasting period. The stylised scheme for each of the PREAM models is constructed in a way that shows both of the cash flow levels described earlier, taking into account the business finance and public sector finance approaches, giving also a more precise (based on input data) description of the FI calculation mechanisms on the state level.

The FI in PREAM models can be divided into four levels as follows:

1. The first level FI is formed by real estate related costs and benefits from the SB. The first FI level does not take into account later transfers from the government sector to the SB. The cash flow on this level represents the direct impact on the SB, i.e., describes the cash-flow that is generated by a

building used by a budgetary institution in every fiscal year. In the following chapters, the first level FI is reflected by the benefits and cost items in the stylised schemes of model 1, model 2, model 3 and model 4. The benefits from the disposal of state real estate (either because of space optimization or from asset disposition to the private sector) is considered as a direct impact to the SB, i.e., the income from the sale of the asset lowers the costs (investments included) generated by the set of the buildings at the same fiscal year. That kind of approach is taken also by the Ministry of Finance, who assumes that the state expenses can be lowered by the revenue obtained through the disposal of state real estate assets.

2. The second level FI is formed by the impact to the government sector as a whole. That kind of an approach is conditioned by the fact that RKAS holds different roles in every PREAM model. The second level FI differs from the first level FI in two basic aspects. Firstly, the state owned enterprise RKAS is acting as a profit-earning business enterprise and therefore, part of the revenue from the state stays within the government sector (in cash flow calculations it has been modelled, using the cash flow rate (see also the description in sub-chapter 3.3.4.)). Secondly, there is a time-lag between the investments made by RKAS and the payments made by the state to cover for those investments; more precisely – the investments made by RKAS are covered by the state via lease payments during the 15-year period.
3. The third level FI is formed by the impact to the SB that takes into account the transfers within the government sector. In this research, this transfer is formed by dividend payments (i.e., gross dividend, as the receiver of the income tax is also the state) made by RKAS to the state and it is modelled using the cash flow rate and the payment rate of gross dividends (both described in sub-chapter 3.3.4.).
4. The fourth level FI is formed by the discounted value of cash flow, directed to the GSA (described further in sub-chapter 3.3.5.).

All the above-mentioned levels of FI take into account only the possible transfers within the GSA and the transfers outside of the GSA (primarily the tax receipts from the private sector) are ignored. Additional discussion about FI is given further in the description of the PREAM models. The stylised schemes of the models depict also the funding sources of the costs (including investments), but in the empirical analysis the financing side is ignored (except in model 3 within the cost-based rental payment calculations).

In all PREAM models, among other things, also the component of the initial unnecessary space (IUS), i.e., buildings that have been already decided to be privatized by the state at the beginning of the analysis period[40], are considered. The IUS is taken into account separately and is not connected to the space, disposed during the later optimization in the PREAM models. The formulas of

[40] It is the space that Ministry of Finance of Estonia decided to dispose of at the end of 2010 (altogether 219 998.1 m^2) and its privatization was planned to be carried out via RKAS.

the yearly calculations of IUS component in the FI on both SB and GSA levels are expressed in Formulas 12a and 12b, respectively, as follows:

(12a) $SB_n = sales\ revenue_n - cost\ of\ sales_n - RKAS\ management\ fee_{n-1} \times profit\ margin \times dividend\ rate$

(12b) $GSA_n = sales\ revenue_n - cost\ of\ sales_n - RKAS\ management\ fee_n + RKAS\ management\ fee_n \times cash\ flow\ rate$

In fiscal impact calculations, the IUS is treated equally in each of the PREAM models. The impact of SB during the year of disposition of the IUS is influenced by the spread, left after the subtracting cost of sales, RKAS management fee, and the gross dividends (paid out from the previous year's RKAS management fee) from the sales revenue. The impact of GSA during the year of the disposition of the IUS, is influenced by the spread, left between the sale revenue, the cost of sales and the RKAS management fee, added by the part of the management fee left within the government sector (it is modelled through the cash flow rate in each of the PREAM models).

In the following sub-chapter, a detailed description of the PREAM models and the model parameters is given. The current thesis assumes a completely deterministic model setting, in which all relevant problem data, including the multi-level cash flow, are assumed known from the outset. The nature and timing of the cash flow generated by a model heavily depend on the contracts and on the payment structure used. In reality, the contractual data influence both inflows (e.g., rental payments) and outflows (e.g., maintenance costs), but within the study the exact contractual timing is loosened because of the unknown.

In order to compare the above described models, the cash flow showing the fiscal impact to the GSA where discounted to the present value, using cost of public sector debt (5.15%) as a discount rate. In these models, the IUS is showed in the stylised schemes of PREAM models, but not in the cash flow formulas. From here, an important research question (RQ.2b) derives:

***RQ.2b**: Whether and in which terms the elaborated four public sector real estate asset management models ought to be comparable to each other in order to answer to the RQ.2a (see the end of sub-chapter 2.1.)?*

3.2.2. Stylised schemes of PREAM models

3.2.2.1. Model 1

In the context of all PREAM models, model 1 can be considered as the so-called base model; i.e., reflecting the initial situation, where most countries are before reforming their public sector assets. Model 1 is also a pure cost-based model, where the state is both the owner and the manager of the public sector real estate assets. The management of those assets is organised in a decentralized way – i.e., every ministry department organises the management of their

assets by themselves. The investments and financing of those investments is done from the SB. The model assumes the existence of many real estate managers and non-efficiency in the asset management system. Also, no return to scale and space optimization is assumed in this model.

Model 1 is applied to both general-purpose and special-purpose properties, using only a cost-based approach in both cases. In this model, also the realization of predetermined IUS at the beginning of the analysis period is assumed (similarly to all the other PREAM models), which is planned to be executed via RKAS. Therefore, in stylised schemes, the impact of IUS disposition also in cash flow connected to RKAS has been shown. On the other hand, as IUS has the same impact on all the PREAM models, then from the formulas of FI to SB and GSA (Formula 13a and 13b, respectively), the cash flow from IUS disposition has been left out.

Based on the above said, it is possible to follow in detail model 1 cash flow streams generated by the set of state real estate assets from Figure 30. This means that Figure 30 maps the impact of nominal or undiscounted cash flow streams (CF 1) both to state budget (SB 1) and to government sector account (GSA 1).

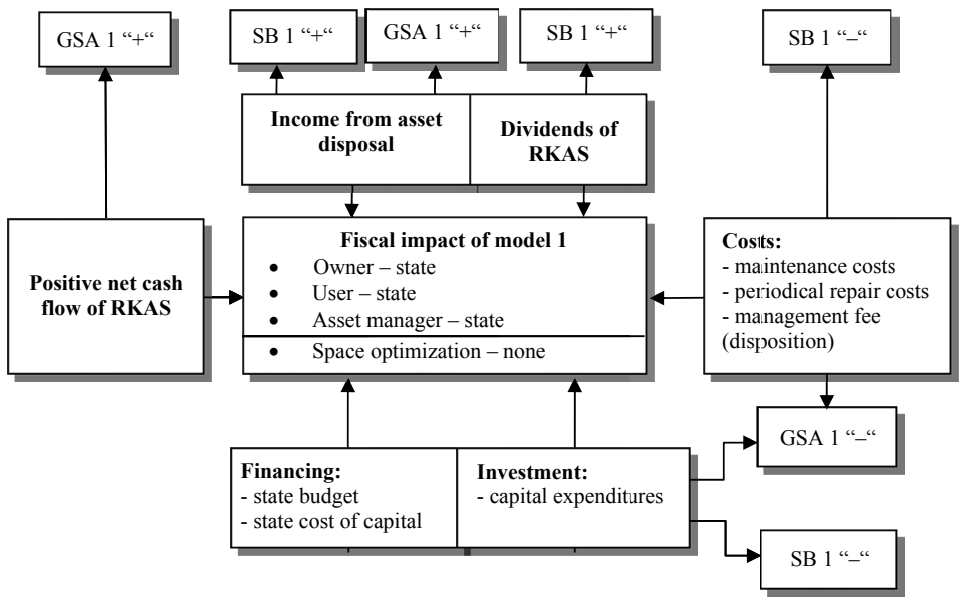


Figure 30. Cash flow scheme for model 1 (CF 1) with the impact of nominal (undiscounted) cash flow streams to the state budget (SB 1) and the government sector account (GSA 1) (Source: Riigi hoonestatud… 2011; modified by the author.)

Cash flow outline in model 1. The cash flow generated through model 1, is formed mainly by the costs (negative cash flow streams), except the positive

cash flow from the disposition of IUS. The costs are associated mainly with the capital investments made by the state to improve the condition of the buildings and with the periodical repair and maintenance costs, which are all borne by the state. The cost item of capital investments is derived from two kinds of sources – at first the primary need for capital investments (the amount was calculated by RKAS, based on state building inventory data) were considered, and the capital investments associated with the needs of periodic repairing of buildings (calculated, based on estimated average depreciation rate applied to the whole set of state buildings).

The distinctive feature for model 1, and, as seen later, also for model 2, is that the negative cash flow generated during the first ten years of the analysis period (i.e., years 2011–2019) is significantly larger than the cash flow in later years, when only the capital expenditure based on depreciation rate is taken into account. The difference between model 1 and model 2 is that no returns to scale are included in model 1 and therefore the negative cash flow is generated as it nominally appears, considering the whole set of state buildings. The main indicators and input data for cash flow formed on the first impact level of model 1 are the following:

- Maintenance costs of capital expenditure (CAPEX) per square meter (m^2);
- Maintenance costs of operational expenditure (OPEX) per square meter (m^2);
- Periodical repair costs per square meter (m^2);
- Percentage share of space types and regions within the set of state real estate assets (%).

Fiscal impact on SB and GSA in model 1. All costs – periodical repair and maintenance costs – have a negative impact on SB and GSA, i.e., all costs are associated with cash outflow. The only positive impact on SB and GSA in model 1 (and also in model 2, model 3 and model 4) is created by the disposition of IUS to the private sector.

Taking account the above said, formulas for calculating yearly cash flow for model 1 with fiscal impact on SB and GSA are created. These formulas (Formula 13a and 13b) are uniformly applied in model 1 for both general- and special-purpose properties and are the following:

(13a) $FI\ on\ SB_n = -\ maintenance\ costs_n - periodical\ repair\ costs_n - capital\ expenditures_n$

(13b) $FI\ on\ GSA_n = -\ maintenance\ costs_n - periodical\ repair\ costs_n - capital\ expenditures_n$

As it is seen from formulas 13a and 13b, without the role of RKAS, the fiscal impact in model 1 is the same to SB and GSA, being also equal to the first level impact to the SB. The main reason stems from the general assumption made over model 1, where the real estate related overall investments and maintenance costs are borne by the state. The variables used in the calculations are explained in more detail in sub-chapter 3.4.1.

3.2.2.2. Model 2

PREAM model 2 is a cost-based model, where the state is the owner of the state real estate assets and makes all the necessary investments, although the management of these assets (in case of both general- and special-purpose properties) is organised in a centralised way by a state-owned enterprise (RKAS), i.e., the management service is outsourced to the state-owned enterprise. Therefore, the existence of return to scale is assumed (i.e., 10% of real estate assets management costs), because of the centralised asset management performed by RKAS, but no space optimization is used in this model.

In essence, model 2 is similar to model 1 as the adequate background has been taken over form model 1; i.e., model 2 is a derivation of model 1. The main assumption of model 2 is that the state is the owner of the real estate assets, but the management service of those assets is bought in from a 100% state-owned enterprise, i.e., RKAS. Therefore, the main difference from model 1 proceeds from the return to scale of costs associated with real estate asset management services. For example, compared to model 1 it is assumed that with a centralised form of real estate asset management it is possible to achieve a decline in the costs related to the real estate asset managers, also to the costs related to the provision of various resources. Therefore, it is generally assumed that the return to scale is greater than zero. Similarly to model 1, also model 2 is uniformly applied to both general- and special-purpose properties, where a cost-based approach is implemented.

Based on the above said, it is possible to follow in detail model 2 cash flow generated by the set of state real estate assets from Figure 31. The figure maps the fiscal impact of nominal or undiscounted cash flow streams (CF 2) both to the state budget (SB 2) and to the government sector account (GSA 2).

Cash flow outline in model 2. Similarly to model 1, in model 2 there are also mainly cash outflows and a negative fiscal impact on SB and GSA during the 30-year cash flow forecasting period (except for the positive cash flow from the disposition of IUS). The negative impact is formed mainly by capital expenditures, periodical repair costs and maintenance. Similarly to model 1, the negative cash flow generated due to the previously planned capital investments made by the state during the first 10-year period (i.e., years 2011–2019) are significantly higher than the cash flow in the later years, when the need for capital expenditures is generated through the depreciation rate. The methodology for depreciation calculations for generating capital investments is similar to model 1, which takes into account also returns to scale in maintenance and periodical repair costs because of the management by RKAS is involved in the model. The main input data forming the first-level cash flow in model 2 are the following:

- maintenance costs of capital expenditure (CAPEX) per square meter (m^2);
- maintenance costs of operational expenditure (OPEX) per square meter (m^2);

- periodical repair costs per square meter (m^2);
- returns to scale from maintenance and periodical repair costs in percentages (%);
- percentage share of space types and regions within the set of state real estate assets (%).

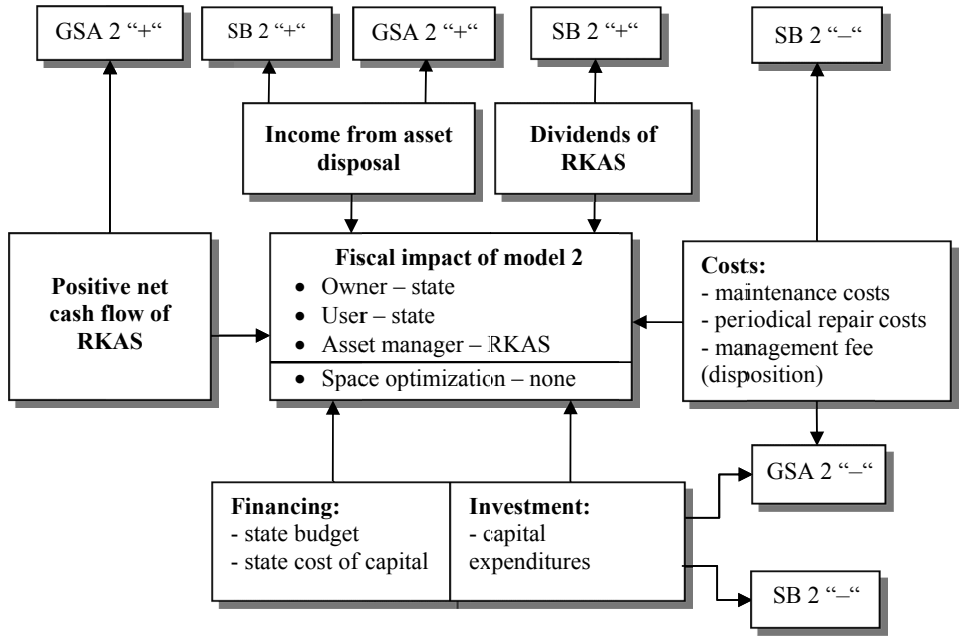


Figure 31. Cash flow scheme for model 2 (CF 2) with the impact of nominal (undiscounted) cash flow streams to the state budget (SB 2) and to the government sector account (GSA 2) (Source: Riigi hoonestatud… 2011; modified by the author.)

Fiscal impact on SB and GSA in model 2. All costs (i.e., maintenance, periodical repair costs, and investments) have a negative impact on SB and GSA. As maintenance and periodical repair services offered to the state by RKAS are profitable and generate a positive net cash flow to the enterprise, then those costs have a positive impact on GSA, whereas the RKAS dividends have a positive impact on SB. The income from the sale of real estate assets (in this case IUS) has a positive impact on both GSA and SB.

Considering the above said, formulas for calculating yearly cash flow for model 2 with FI on SB and GSA are created. These formulas (Formula 14a and 14b) are uniformly applied in model 2 for both general- and special-purpose properties and are the following:

(14a) $FI\ on\ SB_n = -\ maintenance\ costs_n - periodical\ repair\ costs_n - capital\ expenditures_n + net\ income\ rate_{m2} \times dividend\ rate \times (maintenance\ costs_n + periodical\ repair\ costs_n)$

(14b) FI on GSA_n = – maintenance $costs_n$ – periodical repair $costs_n$ – capital $expenditures_n$ +cash flow $rate_{m2}$ × (maintenance $costs_n$ + periodical repair $costs_n$)

The independent variables used in the calculations of Formulas 14a and 14b are explained in more detail in sub-chapter 3.4.1. As part of the payments made to RKAS by the state from SB stay in RKAS, then it makes the fiscal impact on the same year always more positive than the fiscal impact of SB. In addition, the impact on the same year's SB is always more positive than the first-level FI because of the additional dividend payments received from RKAS.

3.2.2.3. Model 3

PREAM model 3 is a centralization model, whereby the state transfers all its real estate assets (both general- and special-purpose properties) to a state-owned company (RKAS) by using market valuation-based non-monetary contributions, and the same company becomes both the owner and the manager of those assets. This means that the state assets are transferred to RKAS based on the market value of the assets at the moment of the transfer on behalf of RKAS' obligation to earn income to the state; whereas the state gets the rights to contribute from the future benefits of RKAS operations.

By handing over the ownership of the real estate assets, the state ties itself to a leasing-contract with RKAS in order to lease back the same required space. Essentially, this means that model 3 assumes a SLB transaction with the state-owned company. In principle, the general-purpose property is leased back with a market-based rental payment and the special-purpose property is leased back with a cost-based rental payment (the contrasting options assume the investment obligation of RKAS). As RKAS is the owner and the manager of the real estate assets, the required investment to those assets is also undertaken by RKAS.

Model 3 differs from model 1 and model 2 in that at the beginning of the cash flow prognosis period (year 2011) the whole set of state real estate (both general- and special-purpose property) is transferred to RKAS as a non-cash payment. In addition, in model 3 (unlike in model 1 and model 2) the set of state real estate is handled different in terms of general- and special-purpose property. While concerning special-purpose property, the basis in rental payments is cost-based rent, then in terms of general-purpose property, the basis is market-based rent. Both rental payments are made by the state to RKAS and they contain also the obligation of RKAS to make capital investments. Special-purpose property is rented by RKAS to the state in terms of cost-based rent, which is formed by the maintenance component, by the periodical repair component and by the capital component. Differently from model 1 and model 2, model 3 includes also space optimization issues. The space freed up by optimization is disposed of to the private sector and the revenue from the sale of the property is handled as a benefit to the SB (in addition to the sale of IUS). The optimization in the set of general-purpose property is included only in the context of office spaces, accounting with the relevant space per one office

worker. In terms of special-purpose property, the optimization is elaborated by taking into account the whole set of special-purpose property and the change in the whole state population is taken as a basis for the space optimization adjustment coefficient.

Based on the above, it is possible to follow model 3 cash flow streams generated by the set of state real estate assets in detail on Figure 32, which maps the impact of nominal or undiscounted cash flow (CF 3) both to the state budget (SB 3) and to the government sector account (GSA 3).

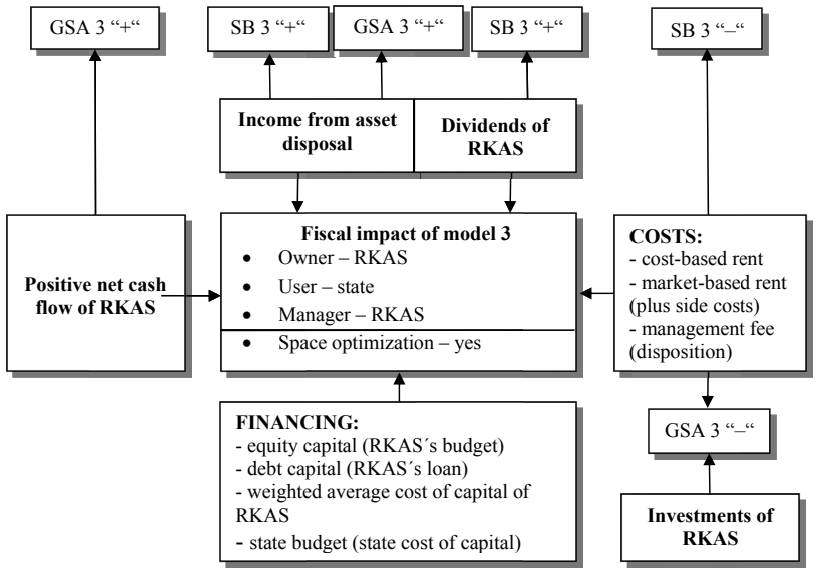


Figure 32. Cash flow scheme of model 3 (CF 3) with the impact of nominal (undiscounted) cash flow streams to the state budget (SB 3) and to the government sector account (GSA 3) (Source: Riigi hoonestatud… 2011; modified by the author.)

Cash flow outline in model 3. The transfer of ownership from the state to RKAS in model 3 is accompanied by the reckoning with the cost-based rent in terms of special-purpose properties (i.e., necessary rent for covering the costs of maintenance, capital investments, and periodical repair). In terms of general-purpose property, market-based rent is accompanied by side-costs (i.e., costs of consumption services).

The costs are adjusted according to the inflation rate. The calculation for depreciation in order to generate capital investments is similar to model 1 and model 2. The returns to scale are treated similarly to model 2. Model 3 takes into consideration also space optimization; whereas the space that is freed up through optimization is disposed to the private sector (the lease of the space to private sector is not possible as RKAS has only limited opportunities to offer the space on the market).

Model 3 assumes also the optimization of spaces and therefore, it is important to also consider the disposition of free spaces.[41] Due to this fact, the potential selling costs of the disposed assets is added to the cost items. The main input data forming the cash flow on the first-level impact in model 3 are the following:

- cost-based rent (EUR/m^2/month),
  - cost of equity capital of RKAS (%),
  - returns to scale from maintenance and periodical repair costs (%);
- market-based rent (EUR/m^2/month),
  - periodical growth rate of market-based rent (%);
- scope of space optimization (m^2);
- proportions of space types and regions within the set of state real estate assets (%).

Fiscal impact on SB and GSA in model 3. The rental payment, paid by the state to RKAS, has a negative impact on the SB at the payment year, and the part of the net profit within the rental payment is paid back to the SB as dividends during the following year. The same rental payment has a negative impact on GSA on the level of the amount of the rental payment that is outreaches the government sector (after transferring it from the state to RKAS).

Hereby, it is important to distinguish between the general-purpose and special-purpose properties. As there is no concrete time-schedule for planned investments to be made by RKAS from the received rental revenue in terms of general-purpose properties, then it is assumed that the amount of the investments equals the capital component within the rental payment paid by the state to RKAS. In terms of special-purpose properties, the time-schedule for planned investments is known and therefore the applied investment calculation mechanics in cash flow has been different. More precisely – RKAS makes an investment (a negative impact on GSA) and earns it back from the state as periodic operational or financial lease (methodologically there is no difference) annuity payments during the 15-years and more, RKAS earns also the return from the invested capital. For making the PREAM models comparable, a simplified assumption was made that RKAS is making investments only from its equity capital[42]. Income from the real estate assets disposition consists of the return gained from the asset disposition through space optimization and also from the disposition of the initial unnecessary assets, having the positive impact on both SB and GSA.

As follows, the yearly formulas of fiscal impact on SB and GSA (Formula 15a and 15b; also Formula 16a and 16b) are defined and additionally commented on, separately in the context of general- and special-purpose properties. Precise explanations of independent variables with their suggested quantitative estimations are given in sub-chapter 3.4.1.

[41] The lease out option to the private sector of these free spaces is not possible, as there is a limited scope for RKAS to earn from the open market.
[42] MS-Excel-based model reckons also with debt financing option, if needed.

The cash flow formulas for general-purpose properties (GPP) in model 3 with fiscal impact to SB and GSA are the following:

(15a) SB_n = – *rental cost(market-based rent)*$_n$ + *net income rate*$_{m3GPP}$ × *dividend rate* × *rental cost(market-based rent)*$_{n-1}$ + *sales revenue(opt.)*$_n$ – *cost of sales(opt.)*$_n$

(15b) GSA_n = + *sales revenue(opt.)*$_n$ – *costs of sales(opt.)*$_n$ – *rental cost(market-based rent)*$_n$ + *cash flow rate*$_{m3GPP}$ × *rental cost(market based rent)*$_n$

As market-based rent contains also the investment component, then compared to models 2 and 4, a different kind of cash flow rate and net income rate have been used in case of the set of general-purpose properties in model 3. Therefore, sales revenue from space optimization, which is used to cover the investments planned to be made in the same year have also been added.

The cash flow formulas for special-purpose properties (SPP) in model 3 with fiscal impact to the SB and the GSA are the following:

(16a) SB_n = – *sales cost(cost-based rent)*$_n$ + *net income rate*$_{m3SPP}$ × *dividend rate* × *rental cost(periodical repair costs*$_{n-1}$ + *maintenance costs*$_{n-1}$*)* + *equity rate of return(RKAS)*$_{n-1}$ × *dividend rate* + *sales revenue(opt.)*$_n$ – *cost of sales(opt.)*$_n$

(16b) GSA_n = + *sales revenue(opt.)*$_n$ – *costs of sales(opt.)*$_n$ – *(periodical repair costs*$_n$ + *maintenance costs*$_n$*)* + *cash flow rate*$_{m3SPP}$ × *(periodical repair costs*$_n$ + *maintenance costs*$_n$*)* – *capital expenditures(RKAS)*$_n$

In addition to the benefits obtained through space optimization, the impact of the set of special-purpose properties in model 3 differs in great extent from similar kinds of properties in model 1 and model 2. As it was discussed earlier, investments made by RKAS have the same impact on the government account in model 1 and model 2, but fiscal impact on the SB is less negative due to rental annuity payments made by the state to RKAS as a cover for investments, which are made from the SB during the 15-year period. An additional cost of capital to RKAS is added to these payments, which outreach the SB (i.e., the required rate of return of an RKAS investment, which is modelled through the cost of equity capital of RKAS).

3.2.2.4. Model 4

PREAM model 4 is a so-called privatization model, which is applied only to general-purpose properties. Here, the following real estate asset SLB scheme is used. At first the state transfers the set of state general-purpose properties to RKAS and then leases the same space back from RKAS, using a market-based leasing contract without any investment obligation. Thereafter, RKAS starts implementing a SLB transaction to the private sector. The real estate asset disposition period is planned for up to five years, during which the assets are sold

gradually to private owners and the same space is leased back with a market-based rental payment, assuming also the investment obligation. As the owner and also the manager of the real estate assets is the private sector, then all the necessary investment is done by the private owner.

The peculiarity of model 4 is that it is applied only to general-purpose properties. For better comparability with other models, cash flow to GSA from model 4 and the cash flow of GSA from a model which generates the least negative result of present value of forecasted cash flow of special-purpose property are summed up.

The main assumption in model 4 is that the whole set of state general-purpose property is sold to the private sector during a 5-year period (in equal proportions) and then sold, but already in optimized amount of space is leased back at once from the private sector (i.e., there is arranged two different contracts at the same time). At first, it is assumed that the set of general-purpose property is going over to RKAS at the beginning of the analysis period (year 2011) as a non-monetary payment. RKAS enters into a lease contract with the state, based on the market-level rental payment without investment obligation, taking account the quality of the rental space. The length of the lease contract is 5 years and the rental payment is adjusted every year according to inflation.

Disposing the real estate assets on a yearly basis to the private sector with the obligation of making capital investments in order to repair and maintain the assets (assuming capital expenditures to be of the same amount as in other models), there is an intention to engage into a lease contract with a market-level lease payment, with 5–7 years length, being also adjusted every year according to inflation. Since by default it is assumed that cash flow to GSA and SB in each model appear at the end of the year, then the first SLB contracts for the real estate assets are made at the end of 2011, and the first rental payments are paid at the end on 2012. Simultaneously with the SLB contracting, also space optimization has been included in model 4 in a way that the amount of space that is already sold to the private sector due to the optimization, is not leased back any more. In model 4 it is silently assumed that after the end of the lease contract, the old contract is renewed according to the market-level rental payment, continuing the leasing of the same space (i.e., the removal expenses in association with the changes of leased space are not taken into account). In the following table, Table 36, major cost and benefit items for model 4 are presented.

Table 36. Major cost and benefit items in model 4 (excluding initial unnecessary space, IUS).

Benefit items	Cost items
• from the disposal of optimized (office) space	• market-based rent paid to RKAS without the investment obligation (before the disposal of state general-purpose properties to private sector)
• from the disposal of general-purpose properties to private sector	• market-based rent paid to private sector with the investment obligation (after the disposal of state general-purpose properties to private sector via RKAS)

Source: compiled by the author.

Based on the above said, it is possible to follow in detail model 4 cash flow generated by the set of state real estate assets from Figure 33, which maps the impact of nominal or undiscounted cash flow (CF 4) both to the state budget (SB 4) and to the government sector account (GSA 4).

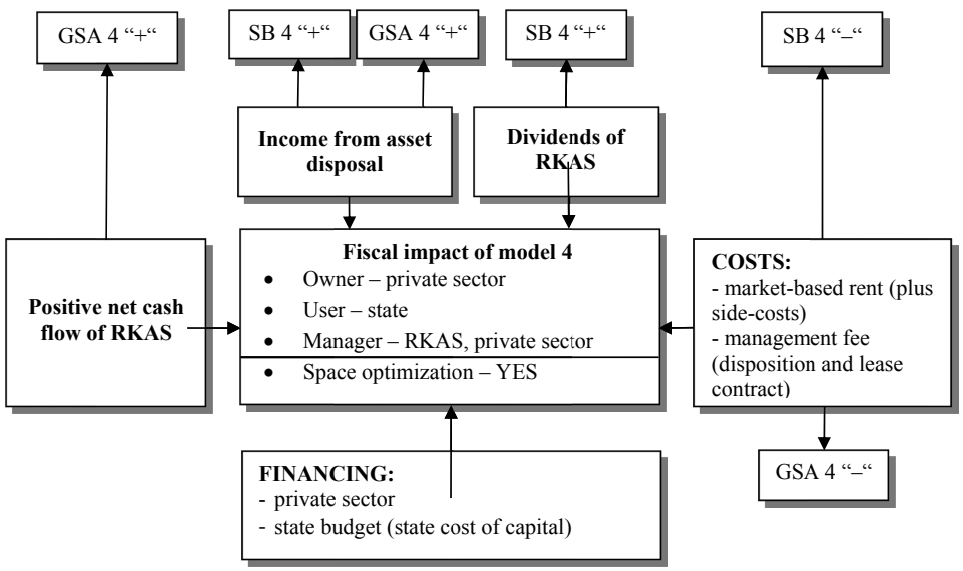


Figure 33. Cash flow scheme for model 4 (CF 4) with the impact of nominal (undiscounted) cash flow streams to state budget (SB 4) and government sector account (GSA 4) (Source: Riigi hoonestatud… 2011; modified by the author.)

Cash flow outline in model 4. In terms of model 4 (applied only to general-purpose properties) it is assumed that the ownership of all the real estate assets are transferred over from the state to RKAS, who deals further with the gradual disposition of these assets to the private sector. Here, for RKAS, the most

important issue is potential market price (market value in the model) from the disposed assets and potential selling expenses (i.e., selling expenses that are calculated based on certain percentage from the sales price of the assets). After the disposition of the assets, a rental agreement between the state as a space-user and the private owner of the space is conducted. Therefore, for the state, market-based rental payment to a private owner becomes a cost item. In addition, there are also costs associated with the use of the space, known as "side costs" (i.e., consumption services).

In terms of long-term forecasts, all costs and benefits are indexed by the expected rate of inflation each year. Space optimization is also assumed, where the selling costs in terms of space disposition are taken into account similarly to model 3. Since the principles of model 4 are applied only to general-purpose properties, then for the comparability with other models, the model is treated and analysed together with model 3 special-purpose properties.

The main input data forming the cash flow on the first-level impact in model 4 includes the following:

- market value of real estate assets (EUR/m^2);
  - yearly growth rate of the market value (%);
- market rent (EUR/m^2/month),
  - yearly growth rate of the market rent (%);
- scope of space optimization (m^2);
- proportions of space types and regions within the set of state real estate assets (%).

Fiscal impact on SB and GSA in model 4. After the disposition of real estate assets to the private sector, the state pays the market-based rent at first to RKAS, who transfers it to the private sector. Therefore, during the payment year, the rental payment has a negative impact on both the SB and the GSA. RKAS is here only in a role of a mediator, who earns a management fee from transferring the state rental payment to the private sector. An important aspect is that the real estate assets are sold to the private sector with either finance or operational lease contracts.[43] The disposition of the assets (also IUS) to the private sector has an impact both on SB and GSA at the same year as the disposition occurs.

The cash flow formulas for model 4 with fiscal impact to SB and GSA (Formula 17a and 17b) are the following:

(17a) $SB_n = +$ *sales revenue*$_n$ $-$ *cost of sales*$_n$ $+$ *net income rate*$_{m4}$ $\times$ *dividend rate* $\times$ *(management costs of* $RKAS_{n-1}$ $+$ *market rent*$(RKAS)_{n-1}$*)* $-$ *management costs of* $RKAS_n$ $-$ *rental cost*$_n$

(17b) GSA_n *(operating lease)* $=$ $+$*sales revenue*$_n$ $-$ *cost of sales*$_n$ $-$ *management costs of* $RKAS_n$ $-$ *rental cost*$_n$ $+$ *cash flow rate*$_{m4}$ $\times$ *(management costs of* $RKAS_n$ $+$ *market rent*$(RKAS)_n$*)*

[43] According to the planned changes in IFRS (IAS 17 "Leases"), all terminal lease contracts will automatically be interpreted as finance lease contracts (see the explanation in sub-chapter 1.3.).

In model 4, general-purpose properties are sold to the private sector and the income generated from the asset disposition is used in the same selling year in RKAS to cover for the expenses that appear in the same year and are associated with the space leased to the state. From that fiscal impact, model 4 distinguishes very clearly from the fiscal impacts in all other PREAM models.

Formula 17b given above expresses the calculation of fiscal impact on GSA in terms of the operating lease contract. In case of a financial lease contract, the payments made at the first rental year are accounted as an obligation and the payments during the following rental years (i.e., 9 years of the total 10) the fiscal impact on GSA is missing (the length of the whole rental period is taken into account as 10 years and after the expiration of this period, the rental period is automatically extended further for the following 10 years). As it is the matter of technicality, in which the whole 10-year rent is expressed only in the first-year fiscal impact instead of dividing it evenly over the whole 10 years, therefore no separate formula is given to cover that. Since RKAS offers a rental service during the first years before the disposition of the assets to the private sector, then part of the income from rental payments paid by the state to RKAS during that time remains in GSA and will be available for the later payment of dividends.

3.3. Discussion over empirical input data of PREAM models

3.3.1. General description and estimation problems of main input data

The following sub-chapter gives an overview of the main input data (their description and estimation problems) in PREAM cash flow models used to draw out the fiscal impact of state real estate assets on SB and GSA of Estonia.

Scenarios. All PREAM models are analysed in the frame of two scenarios (see Table 37 and Appendix 2) – i.e.:

1) Scenario 1 describes how state real estate assets are divided into general- and special-purpose property according to the description given by state institutions (RKAS and S1);
2) Scenario 2 describes how state real estate assets are divided into general- and special-purpose property according to the description given by the Ministry of Finance of Estonia (RKAS and S2).

Data about real estate asset spaces are given by the Ministry of Finance of Estonia[44] (delivered in January 2011), based on the assets inventory of year 2009. The space data of state real estate assets have been taken into account from all over the country. All the rest of the data are given per one square meter

[44] The aggregated database of state buildings' spaces; both leased (from RKAS) and owned.

of useful area. Although the space data of RKAS is given in net internal area[45] (NIA), which is by average 4.3%[46] bigger than the useful space of the building, within the research, the NIA has been considered to be equivalent to the useful space.

Table 37. The amount of area useful to the state as at January 2011 (m^2).

	General-purpose properties	Special-purpose properties	Total
Description by state institutions	52 377.80	1 818 711.,84	1 871 089.64
Description by Ministry of Finance	453 293.50	1 417 796.14	1 871 089.64
Set of state real estate in RKAS	138 921.68	293 903.86	432 825.54
Total useful area of state buildings			**2 303 915.18**

Source: Ministry of Finance database, RKAS database, compiled by the author.

The allocation of spaces by their uses. One kind of input data in PREAM models is also the percentage of the allocation of spaces by their uses among the regions of Estonia (i.e., Tallinn, Tartu/Pärnu, other regions). The template example in allocating the spaces among their uses has been taken from the state assets inventory of 2009. The grouping has been done taking into account also the matching similarity in general cost-base of the spaces. As a result, all state assets (both general- and special-purpose) in PREAM models are divided into three basic groups – i.e., office/housing, education/social, and warehouse/ garage. More precise clarifications about the results of the allocation into different space types among the space groups is given in Table 38. The same table also gives an understanding of the extreme variety of different types of spaces that the state has to deal with.

[45] Net internal area (NIA) is the useful area within a building measured to the internal face of the perimeter walls at each floor level. (RICS Guidance Note 2007: 16)
[46] The result is calculated based on space data from RKAS database in 14.02.2011.

Table 38. The classification of general- and special-purpose property by their uses in PREAM models.

Office/Housing	Education/Social	Warehouse/Garage
Office and administrative buildings	Historical or protected exposed buildings	Farming facilities
Detached houses and summer cottages	Educational and science buildings	Outbuildings
Apartment buildings	Welfare agency buildings	Transportation and communication buildings
Accommodation buildings	Retail and service buildings	Industrial buildings and warehousing
Security buildings	Cultural buildings	Unidentified
	Sports halls	
	Healthcare facilities	

Source: Ministry of Finance, Riigi hoonestatud… 2009; compiled by the author.

The compilation of Table 39 above was based on a relatively conservative approach in handling the objects that were not clearly identified within the set of state real estate assets, and therefore they were classified under warehouse/ garage group of spaces. The results taken from Table 39 were used for calculating the percentage share of each space type within the whole set of useful spaces in state real estate assets (separately for RKAS, the description by Ministry of Finance, and the description by state institutions) taking into account also their allocation among various regions in the country (see tables 39, 40 and 41).

Table 39. The allocation of useful state buildings by their type and region according to RKAS data in January 2011.

RKAS (m², %)	RKAS GPP	RKAS SPP	Total	RKAS GPP	RKAS SPP	Total
	138 921.68	**293 903.86**	**432 825.54**	**32.10%**	**67.90%**	**100%**
Office/Housing	**117 366.65**	**146 590.69**	**263 957.34**	**84.48%**	**49.88%**	**60.98%**
Tallinn	71 573.65	51 712.47	123 286.12	60.98%	35.28%	46.71%
Tartu	4 247.38	0.00	4 247.38	3.62%	0.00%	1.61%
Other regions	41 545.62	94 878.22	136 423.84	35.40%	64.72%	51.68%
Education/Social	**11 056.69**	**136 951.25**	**148 007.94**	**7.96%**	**46.60%**	**34.20%**
Tallinn	11 056.69	37 736.23	48 792.92	100.00%	27.55%	32.97%
Tartu	0.00	8 437.76	8 437.76	0.00%	6.16%	5.70%
Other regions	0.00	90 777.26	90 777.26	0.00%	66.28%	61.33%
Warehouse/Garage	**10 498.34**	**10 361.92**	**20 860.26**	**7.56%**	**3.53%**	**4.82%**
Tallinn	3 890.44	599.27	4 489.71	37.06%	**5.78%**	21.52%
Tartu	0.00	0.00	0.00	0.00%	**0.00%**	0.00%
Other regions	6 607.90	9 762.65	16 370.55	62.94%	**94.22%**	78.48%
Total	**138 921.68**	**293 903.86**	**432 825.54**	**100%**	**100%**	**100%**

Source: Ministry of Finance database, RKAS database, compiled by the author.

Table 40. The allocation of useful state buildings by their type and region according to the description by state institutions in January 2011.

S1 (m², %)	GPP 1	SPP 1	Total	GPP 1	SPP 1	Total
	52 377.80	**1 818 711.84**	**1 871 089.64**	**2.80%**	**97.20%**	**100.0%**
Office/ Housing	**43 647.40**	**797 608.70**	**841 256.10**	**83.33%**	**43.86%**	**44.96%**
Tallinn	21 807.40	282 418.00	304 225.40	49.96%	35.41%	36.16%
Tartu	8 698.60	79 916.40	88 615.00	19.93%	10.02%	10.53%
Other regions	13 141.40	435 274.30	448 415.70	30.11%	54.57%	53.30%
Education/ Social	**1 541.30**	**530 822.94**	**532 364.24**	**2.94%**	**29.19%**	**28.45%**
Tallinn	0.00	168 802.20	168 802.20	0.00%	31.80%	31.71%
Tartu	0.00	37 732.70	37 732.70	0.00%	7.11%	7.09%
Other regions	1 541.30	324 288.04	325 829.34	100.00%	61.09%	61.20%
Warehouse/ Garage	**7 189.10**	**490 280.20**	**497 469.30**	**13.73%**	**26.96%**	**26.59%**
Tallinn	2 172.10	74 691.00	76 863.10	30.21%	15.23%	15.45%
Tartu	432.00	27 672.20	28 104.20	6.01%	5.64%	5.65%
Other regions	4 585.00	387 917.00	392 502.00	63.78%	79.12%	78.90%
Total	**52 377.80**	**1 818 711.84**	**1 871 089.64**	**100%**	**100%**	**100%**

Source: Ministry of Finance database, RKAS database, compiled by the author.

Tabel 41. The allocation of useful state buildings by their type and region according to the description by Ministry of Finance in January 2011.

S2 (m², %)	GPP 2	SPP 2	Total	GPP 2	SPP 2	Total
	453 293.50	**1 417 796.14**	**1 871 089.64**	**24.23%**	**75.77%**	**100%**
Office/ Housing	**343 463.40**	**497 792.70**	**841 256.10**	**75.77%**	**35.11%**	**44.96%**
Tallinn	141 136.40	163 089.00	**304 225.40**	41.09%	32.76%	36.16%
Tartu	38 366.60	50 248.40	**88 615.00**	11.17%	10.09%	10.53%
Other regions	163 960.40	284 455.30	**448 415.70**	47.74%	57.14%	53.30%
Education/ Social	**18 943.60**	**513 420.64**	**532 364.24**	**4.18%**	**36.21%**	**28.45%**
Tallinn	4 937.80	163 864.40	**168 802.20**	26.07%	31.92%	31.71%
Tartu	6 502.00	31 230.70	**37 732.70**	34.32%	6.08%	7.09%
Other regions	7 503.80	318 325.54	**325 829.34**	39.61%	62.00%	61.20%
Warehouse/ Garage	**90 886.50**	**406 582.80**	**497 469.30**	**20.05%**	**28.68%**	**26.59%**
Tallinn	25 674.60	51 188.50	**76 863.10**	28.25%	12.59%	15.45%
Tartu	5 414.50	22 689.70	**28 104.20**	5.96%	5.58%	5.65%
Other regions	59 797.40	332 704.60	**392 502.00**	65.79%	81.83%	78.90%
Total	**453 293.50**	**1 417 796.14**	**1 871 089.64**	**100%**	**100%**	**100%**

Source: Ministry of Finance database, RKAS database, compiled by the author.

The percentage shares of spaces in tables 39–41 are used for calculating the weighted average of market values, market rents, management costs, and side costs (i.e., costs of consumption services and support services).

Initial unnecessary space (IUS). IUS is treated separately from the unnecessary space disposed of as the result of space optimization (see also "Benefit from optimization" below). The size of IUS in January 2011 was 219 998.10 m^2 in terms of useful area and the treatment of IUS has been implemented equally in all PREAM models. In all models, it has been assumed that the amount of IUS is disposed of during the period of five years (from 2011 to 2015) in equal amounts, which means 43 999.62 m^2 per year (= 219 998.10 $m^2/5$).

In association with IUS, the potential proceeds from sales, selling expenses and the management fee of RKAS from the residue of the unsold IUS have been taken into account. The latter has been added due to the assumption that the unsold space needs still some management, which is undertaken by RKAS. The proceeds from the sale of IUS have been calculated as a weighted average, taking into account the general classification for the spaces in Table 39 and the estimated regional market values (Tallinn, Tartu, other regions) per square meter. The cash flow calculations within the models include also the potential growth in market values, which has been equalled to the expected yearly growth in consumer price index. According to Table 42, the weighted average market value of IUS at the beginning of 2011 was 210.85 EUR/m^2.

Table 42. The area and market value of initial unnecessary space (IUS) by regions and space types in January 2011 (m^2, %).

	Useful area, m^2	**Share, %**	**Market value, EUR*/m^2**
Office/Housing	**89 268.20**	**40.60%**	
Tallinn	27 774.00	31.10%	**575.20**
Tartu	3 161.10	3.50%	**383.47**
Other regions	58 333.10	65.30%	**127.82**
Education/Social	**71 249.10**	**32.40%**	
Tallinn	27 192.20	38.20%	**511.29**
Tartu	4 536.00	6.40%	**319.56**
Other regions	39 520.90	55.50%	**95.87**
Warehouse/Garage	**59 480.80**	**27.00%**	
Tallinn	2 939.70	4.90%	**223.69**
Tartu	1 412.60	2.40%	**127.82**
Other regions	55 128.50	92.70%	**31.96**
Total	**219 998.10**	**100%**	

* Converted from Estonian kroons, where 1 EUR = 15.6466 EEK.

Source: Ministry of Finance database, RKAS database, compiled by the author.

As the amount of IUS was the same for all PREAM models and for all scenarios, then the calculation of it was viewed separately from the cash flow estimation of the base-models. During the estimation of the market value of IUS per one square meter, the value of land was taken into account; at the same time, the probability of the potential separation of properties (the same accounts also for the unnecessary space from optimization) has not been included.

Cost of sales (CS). Under CS the costs associated with the disposition of the real estate assets (i.e., costs to RKAS, transaction costs included) were examined. According to the best practice concept, used in the CS estimation, a fixed rate of 1% from the sales revenue during the whole cash flow forecasting period has been used. As the disposition of assets takes place via RKAS, then the CS is assumed to be financed from the budget of RKAS.

Returns to scale. Returns to scale create the presumption for the better usage of resources and for lowering the unit cost, also for risk diversification, for greater flexibility in space usage and in offering the services. Models 2, 3 and 4, assume returns to scale in management expenses due to optimization and lower unit costs. Models 2 and 3 assume the returns to scale to be 10% in maintenance costs and in periodical repair costs. In model 4, where the assets are disposed of to the private sector, the return to scale is automatically included into the market rent as one of its components.

Maintenance costs. In terms of maintenance costs, the classification taken from the Estonian facilities management standard EVS 807: 2010 (see Table 43 and Appendix 3) has been followed. The included classifiers are with group code 100–700 (excluding group code 400, which has been submitted as an item of separate periodical repair cost)[47].

Table 43. Main groups of classification for the immovable asset management activities (used in the analysis of PREAM models).

Group code	The main groups	Short for the complex activities
100	Administration of the property	Administration
200	Technical maintenance of the structures and facilities	Technical maintenance
300	Cleaning and waste disposal	Up-keeping
400	Repair and reconstruction on the property	Repairing
500	Owner's legal and contractual obligations	Owner's obligations
600	Consumption of utilities	Consumer services
700	Operational services to support core business	Operational services

Source: EVS 807: 2010; Liias 2002: 418.

[47] Liias (2002) states that the Estonian standard of maintenance of facilities is formed based on an activities-based approach. The same approach is used in cost accounting theory, where one of the research fields – activity-based costing (ABC) – is suggesting the use of a similar kind of a system, i.e., a costing system, where costs are assigned based on an appropriate activity cost driver such as the number of procurement instances (Kim and Ballard 2001).

Respecting an expert opinion different levels of maintenance costs for different groups of assets in the set of public sector real estate (see table 44) have been used. At the time the empirical analysis was carried out, there was no adequate database covering the maintenance costs for those buildings that did not belong to the set of RKAS.[48] Association of Estonian Facilities Administrators and Maintainers (AEFAM) reported in October 2010 an expert opinion about the market price levels of maintenance costs in Estonia, where the cost level of maintenance services (based on cost codes 100–700) in Tallinn was 2.55–4.15 EUR/m^2/month, and the level of real estate administration costs (according to cost code 100) was 0.19–0.32 EUR/m^2/month (within this research, the maintenance costs by default contain also the component of administration costs, excluding administration costs that are a part of the real estate asset transfer).

On buildings of RKAS, the actual maintenance costs (including classification codes 100–300, 500 and 600) from January 2008 until June 2010 have been included using the database of RKAS. The reference group of general-purpose properties consists of 48 buildings (office buildings of RKAS) and the reference group of special-purpose properties consists of 13 buildings (called special use buildings of RKAS, e.g., prisons). As a result, the average maintenance cost for general-purpose properties is 3.25 EUR/m^2/month and for special-purpose properties 3.76 EUR/m^2/month. Both costs are calculated per square meter of useful area. All the numbers of maintenance costs in Table 44 are taken as the basis for the first year in benefit-cost cash flow analysis.

Table 44. Maintenance costs according to the types of space of RKAS and the rest of the state real estate assets.

	GPP/SPP*			**RKAS GPP****			**RKAS SPP****		
	Office/ Housing	Education/ Social	Warehouse/ Garage	Office/ Housing	Education/ Social	Warehouse/ Garage	Office/ Housing	Education/ Social	Warehouse/ Garage
Maintenance costs (EUR/m²/month)	2.55	2.55	0.83	3.25	3.25	1.02	3.76	3.76	1.02

* estimated; ** actual

Source: RKAS database, experts' opinion, author's calculations.

In the cash flow analysis, the maintenance costs have been adjusted for the inflation rate forecast for 30 years. Similar kinds of maintenance costs have been assumed in case of all PREAM models with the 10% returns to scale assumption in models 2 and 3. Because of the lack of data on maintenance costs

[48] Due to the lack of reliable data, the potentially existing inverse relationship between the maintenance costs and capital expenditures in the cash-flow analysis of PREAM models has not been taken into account.

before and after the centralization of real estate assets management under RKAS, only an estimated level of returns to scale has been used.

As one of the basic principles of the EU energy and climate policy is saving energy, then the EU has set up an aim for year 2020 to spend 20% less primary energy compared to the level for year 1990. Therefore, on the one hand also the planned energy-savings in newly renovated buildings and proceeding lower the maintenance costs should be taken into account, but on the other hand, as experts have also predicted some rise in the energy cost level, it is possible to presume the elimination of energy cost savings with that future rise. As a result, no change in the energy cost level within maintenance costs in cash flow analysis has been considered with.

Periodical repair costs (non-capitalized investments/repair works) (see also sub-chapter 3.4.2., Figure 34). In this paper, periodical repair costs are interpreted as non-capitalized investments according to the EVS 807: 2010 costs classification code 400. In PREAM models, the initial amount of periodic repair costs at the beginning of the analysis is 0.19 EUR/m^2/month, taking account the data presented in Table 45.

Table 45. Periodic maintenance costs from comparable sample sources.

Source	Year of data gathering	Periodic repair costs, EUR/m^2/month*	Description of the sample
RKAS**, including	2010	0.14	Mainly buildings in average repair
office buildings		0.16	
special use buildings		0.03	
academic buildings		0.23	
TTU research, based on 9 apartment houses	2003–2005	0.13	Mainly older buildings not in very good order with average building time 1965, average useful area 5468 m^2
Finnish research, based on 164 apartment houses	2003–2005	0.32	Constantly maintained buildings in relatively good order with average building time 1976, average useful area 3714 m^2
Average		**0.197**	

*All data are given without VAT and per square meter of one useful area.

**Based on actual costs associated with the so-called current repair and emergency technical maintenance costs.

Source: EKHHL *et al*.; RKAS database; compiled by the author.

It is relevant to remark that periodical repair costs over the whole cash flow period from 2011 up to 2040 have been included in the calculations. Also, the cost item of periodical repair is adjusted according to the yearly estimated CPI and in model 1 and model 2 also returns to scale of 10% have been additionally accounted with

Capital investments (see also sub-chapter 3.4.2.). Two types of capital investments associated with the real estate assets (reckoned as different cost lines in benefit-cost analysis) have been included in this study:

1) Initial capital investment (the sum was calculated based on asset inventory in 2009, conducted by Ministry of Finance);
2) Capital investments based on real estate asset maintenance (the sum was generated through the expected depreciation of the assets, which in turn is based on estimated cost of construction per one square meter).

While the initial capital investment appears as a cost during the years 2011–2019, then capital investments based on real estate asset maintenance appear as a real source of cost during the whole cash flow prognosis period in years 2011–2040. As initial capital investment is associated primarily with a sharp initial improvement of the real estate objects, where no additional costs for maintenance are involved, then a separate cost line for maintenance-based capital investments have been applied. More precisely, within this empirical analysis, it is assumed that those capital investments that are tied up with maintenance are interpreted as real estate asset-related maintenance capital expenditures or "capex" in terms of EVS 807: 2010 cost classification code 400. Considering the approach to the whole set of state buildings, the following equation (Formula 18) holds throughout the forecasted cash flow period:

(18) Maintenance capital expenditures (capex)$_t$ = Depreciation costs$_t$.

Cost-based rent. The basis for the interpretation of cost-based rent is taken from the definition given by the National Audit Office of Estonia. It says that cost-based rent is a rent that reflects (Riigihangete... 2003: 7):

a) the costs of the lessor (personnel and management expenses, relevant investments for lessor, costs related to owner responsibility);
b) security expenses of the building and its territory;
c) building utilities expenses;
d) depreciation cost of the building;
e) cost of overall capital (both cost of equity and cost of debt) of the capital investments;
f) owner's profit.

Within the current thesis, cost-based rent is a relevant input data in model 3 for special-purpose properties and it is formed based on the following three main components:

1) maintenance cost component (contains all those costs that are not related to the short- and long-term investments made for the state real estate assets);
2) periodical repair cost component (i.e., non-capitalized investments), and
3) capital expenditures component (i.e., capitalized investments with their cost of capital).

One of the main and by interpretation the most difficult components in cost-based rental payment is the capital expenditures component. Here, the capital expenditures component is calculated based on the investment requirement from the state (i.e., initial capital expenditures) and the maintenance capital expendi-

tures (in model 3 the amount of it is similar to model 1 and model 2). In order to hold on and contribute to the comparability of the models, where the required sum of capital investments has been converted into the form of annualised payments. At the same time, it is assumed that the financing of those required capital investments has been performed only, in 100%, from RKAS equity capital. Additionally, also the 5.87%[49] (the estimation is based on information issued by the Ministry of Finance about the cost of state company equity) of the cost of unleveraged equity capital of RKAS and the 15-year long financing period (i.e., the expected payback period of investments made by RKAS) have been calculated with. The debt financing option has not been considered with, but the respective option is inserted in model 3 in MS Excel file "PREAMmodels.xlsx" to be employed according to its relevance. However, in case of the use of debt financing, it is important to assume that 70% of the capital is invested as debt (accounting with 5% fixed rate of cost of debt capital) and 30% of the invested capital is equity. The shares of debt and equity capital within the overall invested capital are suggested by the Ministry of Finance as recommended input data. Therefore, in terms of a mixed financing scheme, the suggested weighted average cost of capital would be 5.57%.

Side costs. These are costs of consumption and support services that are, according to the real estate market practice in Estonia, usually added to the contractual rental payment (EVS 807: 2010). In model 3 and 4 market-based rent, which is applied to general-purpose properties, does not contain side costs, but the cost-based rent which is applied to special-purpose properties, does. That is why it seemed to be better for the balancing and comparability of costs to show the side costs on a separate line in the model (i.e., the sum of cost group 600 – electricity, heating, water and sewerage). As known to the author, there are no statistics gathered or research carried out about the actual level and amount of side costs neither in Estonia nor in Scandinavian countries. Therefore, within the current analysis the information gathered via RKAS database about their average costs of consumer services per one square meter of useful area in office buildings and in buildings of special uses (i.e., prisons, houses of detention, facilities on the border crossings) from the period of January 2008 up to November 2010 (see Table 46) has been applied. The average result for the side costs of those buildings was 1.69 EUR/m^2/month. For the group of buildings of warehouse/garage, only the cost of electricity was taken into account and using the approximate cost of 1 kWh/m^2/month as a proxy, the result was 0.06 EUR/m^2/month. The total amount of side costs in the analysis is adjusted for a yearly basis and taking into account also the total amount of space

[49] The unleveraged cost of equity of RKAS has been calculated as follows: 5.87% = 3.65% + (0.19 × 5.0%) + 0.97 + 0.3; where 3.65% is estimated risk free rate of return (i.e., German long-term 10-year bond yield), 0.19 is unleveraged asset beta of the industry, 5.0% is an estimated market risk premium, 0.97 is Estonian country risk premium (found by the median rates difference of Estonian and German 5-year CDS (credit default swap) during 08.02.2006 up to 20.08.2010) and 0.3 is a company-specific risk premium. Accordingly, the leveraged cost of equity capital of RKAS is 6.92%.

in square meters under a particular type of general-purpose properties. The side costs are adjusted further with the yearly estimated CPI.

Table 46. The preliminary level of side costs according to the space classification for general-purpose properties in model 3 and model 4.

	GPP / RKAS GPP		
	Office/Housing	Education/Social	Warehouse/Garage
Side costs (EUR/m²/month)	1.69	1.69	0.06

Source: RKAS database, author's calculations.

Although, the dataset described above is based estimations and requires further in depth analysis, it includes still the best available options in hand for the most adequate empirical analysis.

Benefits from space optimization. The useful space for public sector or the overall space area in buildings used by the state is a function from the needs of an organisation (i.e. state government), number of employees, space norm per one employee and the supply of the space in the market or from the factors of the building sector.

A twofold approach to space optimization in PREAM models was used concerning general-purpose properties. The applied approaches resulted from the following main reasons:

(1) reduction of the useful area per one administrative worker in square meters; and

(2) general reduction in population, which leads to the expected decrease in the number of public sector administrative workers within the given time period and it frees up the space that may turn out to be unnecessary for the state.

IUS is not added to the optimized space, but is kept separate from that. The optimization takes place only in model 3 and model 4, not in model 1 and model 2[50] (i.e. in these models, fixed amount of space usage is assumed during the whole cash flow forecasting period despite changes in the factors that affect it, e.g., leaving the buildings under state ownership).

The benefit of optimization of general-purpose properties (the optimization is applied only to office spaces as other spaces are not related to the workplace and the number of administrative workers) stems from the intensification of the usage of space proceeding from the decreasing usage of square meters of space per administrative worker and the freed up space is disposed to the private sector. In the current situation, the dispositioning is seen as the only option, because of the common practice in the public sector so far.

[50] Yet, the common practice reflected that during the 20-year period (before the current analysis) no space optimization in terms of state real estate assets has been enacted cognizantly. Instead, only spontaneous decay and destruction was allowed to take place, which did not reflect any kind of thrifty attitude from the state´s side.

Although, disregarding the decreasing population figures, public sector tasks remain the same, the estimation of the growth of public sector employees is still negative. The prognosis for the number of public sector employees is based on general employment estimation and the average percentage of public sector within it. In general, the overall trend over the next few decades is estimated to be on the decrease in overall employment and also in the public sector employees as a part in it. According to statistics, both the arithmetic and median average share of public sector employees in total employment during the period of 2000–2009 was 3.3% (Avaliku teenistuse aastaraamat 2000–2009). This figure is used as a proxy number for calculating the number of public sector employees from the forecasted total employment in Estonia (presented as one of the general macroeconomic data by Ministry of Finance) from 2011–2040[51].

In the current thesis, it is assumed that (based on projected cost normative, determined by the Ministry of Finance) in case of continuing with the existing set of state buildings (where the so-called cabinet system is used predominantly), the maximum required useful rental area per one state employee would be 20 m^2. At the beginning of the analysis, the actual space usage was 26 m^2 per state employee, on average. As a result, the overall need for optimization at the beginning of the analysis was 19.20% of the existing general-purpose properties.

In case of special-purpose properties, only the reduction in overall population has been taken into account as the basis for space optimization. Optimization for special-purpose properties takes place during the whole forecasted cash flow period, but it is recalculated after every five years, according to the reduction of the expected average population during the 5-year period. Similarly to GPP, the only option for freed up space is disposition.

Sale and leaseback of general-purpose properties. In modelling the SLB of GPP in model 4, also costs associated with the transfer of the state real estate assets to RKAS have been included. For example:

1) maintenance fee (for the maintenance of the set of transferred GPPs), which was estimated to be by average 0.32 EUR/m^2 from the residual value of the set of disposable real estate assets; and
2) average management fee of lease contract for RKAS, which was estimated to be 0.13 EUR/m^2 from the leased-back space, taking into account real estate expert opinions.

Both above-mentioned input data are adjusted according to the estimated CPI. Additionally it is assumed, that the real estate assets are disposed to the private sector during the 5-year period, where the whole set of disposable GPPs are divided equally across assumable selling-period and thereafter the state leases back that amount of space, which is already optimized.

[51] Hereby, because of the conservative approach, the possible reduction in the numbers of state employees due to the enlarging of e-government services has been left out.

Discounted cash flow (DCF). Within the current empirical analysis, DCF is assumed to be cash flow that considers the difference between GSA in- and out-payments. It is possible because the GSA-related cash flow within this thesis is accounted on a cash-basis, not on accrual-basis (as it is normally assumed to be, according to ESA95 manual on Government Deficit and Debt: Methods and Nomenclatures). The other reason lies in the fact that GSA takes account also the cash flow, w related to RKAS, as the state balance excludes that part from the cash flow.

The discounting of cash flow is implemented in every PREAM model with the aim to make all the models comparable to each other. In every model, the applied discount rate is 5.15% (holding the discount rate fixed within the whole cash flow prognosis period), assuming that the governmental deficit that appears with the set of state real estate assets, can be financed either through loans or using the surplus from the other components of the government sector. The basis for the discounting has been taken for the whole forecasted cash flow period (from year 2011 to 2040) and the terminal value at the end of year 2040 (based on perpetual cash flow after year 2040). The growth rate for the perpetual cash flow was 2% per year, which results from the long-term estimation of constant GDP growth rate. For every PREAM model, the sum of discounted cash flow has been calculated based on the following formula, Formula 19:

$$(19) \qquad PV_{GSA} = \sum_{t=1}^{n} \frac{GSA_t}{(1+r)^t} + \frac{\frac{GSA_n \times (1+g)}{r-g}}{(1+r)^n},$$

where r is discount rate, g is terminal growth rate, period t denotes year 2011 (i.e., the beginning of the cash flow forecasting period) and period n denotes year 2040 (i.e., the end of the cash flow forecasting period). From the logic of the above formula, it is assumed that the discount rate is bigger than the terminal growth rate (i.e., $r > g$). In addition, the continuation of the same terms is assumed until infinity *ceteris paribus* for that cash flow that appears after the end of the detailed cash flow forecasting period (i.e., after the year 2040).

3.3.2. Estimation and prognosis of capital expenditures

It is extremely important to most adequately assess the necessary amount of investments to state real estate assets, as it is a cost item that has a remarkable effect on SB as well as on GSA. It is also an essential and inevitable cost in a sense that it helps to maintain or even increase the market value of the asset.

At first, the approach to real estate asset-related investments analysis was elaborated on. The analysis is depicted on Figure 34. All asset-related investments within the study are divided into two main categories; i.e. to short- and long-term investments. While short-term investments are considered to be periodic repair costs, which are by essence non-capitalized investments (cost classification 400, forecasted for years 2011–2040 and beyond), then long-term

investments are those which are capitalized and depreciated during the assets' economic life.

The approach used in the present thesis corresponds to the approach described in Estonian property standard EVS 875-10-2013, where real estate asset related costs are divided as:

1) operating expenditures (OPEX), and
2) capital costs, i.e.:
   a) capital expenditures (CAPEX), and
   b) invested cost of capital (interest).

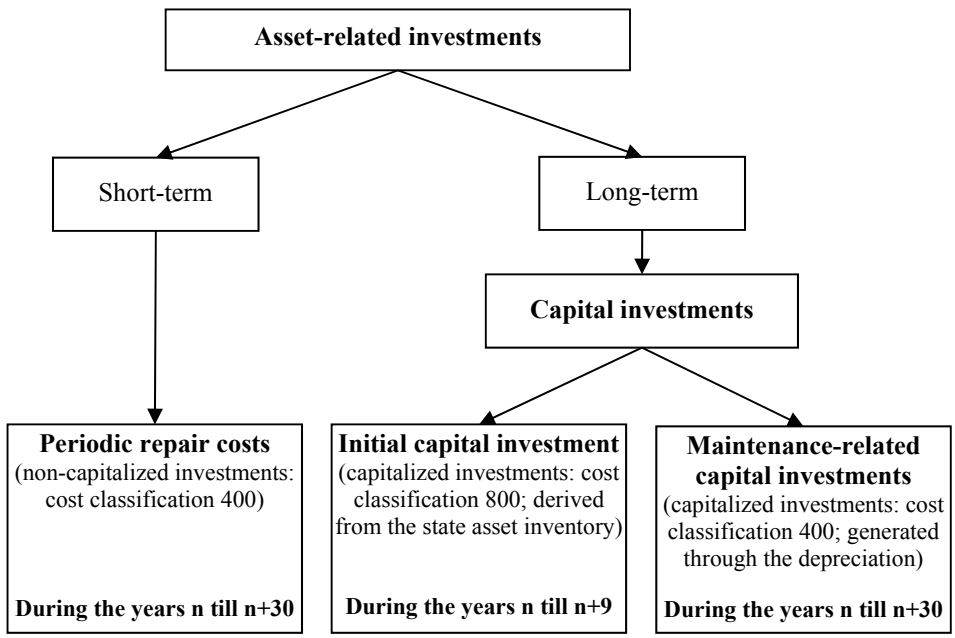


Figure 34. The structure of the applied maintenance costs to the set of state buildings during the planned 30-years cash flow forecasting period. (Source: compiled by the author)

Capital investments of state buildings as a main cost item within the present research, has been divided into two categories – i.e., into initial capital investment (cost classification 800, as a development cost) and maintenance-related capital investment (cost classification 400). The main difference between the two capital investment categories is that when initial capital investment is forecasted only for the first 9 years at the beginning of the cash flow prognosis period, then maintenance-related capital investment has been calculated for the entire prognosis period, from 2011 to 2040 and beyond.

After the identification of periodic asset-related investments, a possible solution for the quantitative estimation of capital investments was developed. There are many alternative ways how to reach the potential estimation of the

needed amount of capital expenditure and how to forecast it further as state spending during the next 30 years. The possible approaches for the calculations of capital expenditures under consideration were the following:

1) To use RKAS data about the already transferred state real estate assets from state ownership to RKAS ownership, and to compare the data before and after the renovation of those buildings, ending up with a numerical estimation per one square meter of the average allocation of investments made for buildings in different types of conditions, which is applied to the existing set of state buildings as an estimation of required capital investment.

In analysing the applicability of this option, it turned out that according to the data gathered through the asset inventory, the average condition of the already transferred state buildings were by average in poorer condition than the total set of state buildings. Therefore, the average renovation cost as major capital investment per one square meter made by RKAS could be substantially bigger than the whole set of state buildings would require. At the same time, a more crucial problem occurred – both the state and RKAS were lacking the knowledge over the exact data of already transferred state buildings' condition before renovation started at RKAS and later the identification of it turned out to be too difficult. Therefore, that kind of approach was skipped for ascertaining the amount of required capital expenditures.

2) The possibility to use state accounting data, by taking into account the initial cost, depreciated replacement cost (DRC) and economic life (EL) of each of the state buildings as the basis of the calculation was weighed.

The implementation of the given option was rejected due to the fact that the state financial statement contained only aggregated data about state assets and it would have been unnecessarily complicated to separate the relevant data about state buildings from the irrelevant ones. Finally it was concluded that even if such calculations would be undertaken, the received result would most possibly not reflect the actual requirement of capital expenditures with sufficient adequacy for the current research.

3) To use the preliminary assessment of capital expenditure requirement made during the state assets inventory for the first 9 years of forecast and thereafter, the yearly capital expenditure requirement is derived via estimated cost of construction per one square meter of useful area.

Taking into account all the other options, the latter was the most reasonable to use because of the biggest objectivity with the least consumption of time and other resources. Based on the assessed estimation of initial capital investment requirement (total sum EUR 0.53 billion including VAT, at 2009) and adjusting it according to time and the size of the set of state buildings (all together *ca* 2.3 million m^2 of useful area, see Appendix 1), then the total sum of initial required capital investment at the beginning of 2011 was EUR 0.682 billion,

which is divided across the first 9 years[52] at the beginning of the cash flow forecast according to the scheme presented in Table 47.

Table 47. The estimated initial capital investment for the whole set of public sector real estate assets during years 2011–2019

Years	2011–2014	2015–2019	Total
Sum of capital investment, EUR	0.54 billion	0.14 billion	**0.682 billion**
Share	79%	21%	**100%**
Capital investment per year, EUR/m²	58.45	12.43	**N/A**

Source: compiled by the author.

The yearly capital expenditure requirement is reached by multiplying capital investment per year (given in EUR/m^2) with the size of useful area of the set of state buildings (the set of RKAS and the rest of the set of state buildings are considered to have the same quality level). The amount of capital expenditure is adjusted by CPI estimation per year.

In addition to the initial capital investment, a maintenance-related capital investment, reached via the cost of construction of state buildings and rate of depreciation, has been taken into account throughout the whole cash flow forecasting period. In order to calculate the cost of depreciation, the construction procurements of RKAS at the second half of year 2010 have been taken as basis. At that time the average cost of construction was 703 EUR/m^2 (both GPP and SPP, without VAT), which was by average a higher result than on Estonian construction market in general at that time. As in result of the improvement of the state buildings' condition, also a change in the buildings' quality class takes place; a dynamic approach for generating the estimated rate of depreciation is used instead of a fixed rate of depreciation for the whole forecasting period.

Table 48. The rates of depreciation used for generating capital investments from the cost of building during the period 2011–2040.

Years	2011–2019	2020–2030	2031–2040
Rates of depreciation	2.5%	2.0%	3.0%

Source: compiled by the author.

As seen from Table 48, the 30-year cash flow forecasting period is divided into three stages from the capital investments point of view. The used rates of asset depreciation (excluding the periodic repair cost) for generating the sum of maintenance-related capital expenditure requirement during these stages were the following (see Table 48):

[52] As the sum of estimated initial capital investment has been calculated according to the data gathered through the state real estate inventory at the end of 2009, but since the beginning of the current analysis was 2011, then the initial sum of capital investment has been divided over 9 years, remaining within the initially planned investment schedule for existing state real estate, which was originally planned to be 10 years in total.

1) during 2011–2019 a 2.5% rate of depreciation from the inflation-adjusted cost of construction has been used, assuming that all the buildings within the set of state real estate assets have not yet undergone the entire renovation to reach a good condition;
2) during 2020–2030 a 2.0% rate of depreciation from the inflation-adjusted cost of construction has been used, assuming that state buildings, which are already in a good condition, require less additional capital investment within this period comparing to the previous one;
3) during 2031–2040 a 3.0% rate of depreciation from the inflation-adjusted cost of construction has been used, assuming that the state buildings already approach the end of their economic life and therefore the requirement for additional maintenance-related capital expenditures is going to increase.

It should be remarked that the above described approach to the rates of depreciation based on generation of capital investment is only one view to the described problem. At the same time, the MS Excel-based model allows inserting and using also other kind of data about the rates of depreciation; for example, the fixed rate for the whole forecasting period, if it is needed.

3.3.3. Market-based input data of state real estate assets

The following sub-chapter discusses the direct real estate market-based input data. The main emphasis is on problems in acquiring input data associated with real estate market value and market rent, which takes into account different characteristics of the set of public sector real estate assets (e.g., location, condition of the buildings). The dynamics of those input data is discussed in sub-chapter 2.5.2.

Market value. Market value is an essential data in all cases that are associated with the disposal of real estate assets across the PREAM models. There are mainly three types of cases, where market value appears as data: firstly, with the disposition of IUS; secondly, with optimization in model 3 and model 4; and thirdly, with the disposition of state real estate assets to the private sector in model 4. What is important to note, is that both in model 3 and model 4 the real estate assets are transferred from state ownership to RKAS in their estimated market value, but as the transfer in practice is executed in the form of a non-cash payment, then in reality that kind of fact is ignored in the present calculations.

The capitalization model (presented in sub-chapter 2.5.2.) in elaborating market rent and market value for the fiscal impact analysis of state real estate has not been included in the current research. Instead, the presented market value data is based on real estate market experts' opinions about the estimated level of market value per one square meter (based on comparable market contracts at the end of year 2010) over the three types of buildings or space usage (i.e., for office and accommodation buildings, for educational and social buildings, and for warehouses and garages) and for three different regions in Estonia (Tallinn, Tartu, other regions) (see Table 49).

Table 49. The estimated market value of the whole set of state real estate according to regions and use of space (at the beginning of year 2011, EUR/m²).

Region*	GPP / SPP		
	Office/Accommodation	Educational/Social	Warehouse/Garage
Tallinn	575.20	511.29	223.69
Tartu	388.47	319.56	127.82
Other	127.82	95.87	31.96

* Only major cities in Estonia are taken into account separately, other regions are seen as one.

Source: experts' opinions, compiled by the author.

In all cases – for IUSs, for optimized spaces and also for disposing of the general-purpose assets to the private sector – the weighted average of the same market value estimations have been based on ending up with one number for market value per square meter of useful area (see Table 50).

Table 50. The applied weighted average of estimated market value for general-purpose properties per one square meter.

GPP / IUS	Market value, €/m² *
Set of RKAS and description by state institutions	382.84
Set of RKAS and description by Ministry of Finance	313.00
Initial unnecessary space, IUS	156.63

* Valid for year 2011; adjusted further with the estimated CPI.

Source: experts' opinions, compiled by the author.

The growth rate for market value in PREAM models is 0% in year 2011, the year after that it is estimated to be 3% and thereafter the consumer price index has been applied as a growth rate for estimated real estate market value in forecasted cash flow calculations.

The reason for excluding the capitalization method (discussed earlier) is based on the ultimate sensitivity of the capitalization rate to market changes. In order to give an estimated value to the whole set of state buildings it would be extremely difficult, considering the data available, to consider the method. The use of the method would most possibly entail greater deviations in the final result than the previously described and used method. The estimated market capitalization rate as an input data has been used only in expressing the impact of financial lease on the level of GSA (see also sub-chapter 2.3.5.).

Market rent. Market-based rent or market rent is relevant input data in model 3 and model 4 in relation to general-purpose properties. Market rent (sometimes also 'economic rent') is a rental payment that a real estate asset would receive on the free market. Market rent is identified by realtors through the analysis of asked and paid rent levels of comparable assets. Market rent may change constantly during the economic life of the asset due to changes in

market conditions and the competitiveness of the asset (EVS 875–3: 2010, p. 5.4.1.). This research uses the estimated level of market rent per square meter for three different types of buildings or space usage and for three different regions in Estonia. The estimated level of market rent is acquired and put together with the help of data gathered through interviews (conducted at the end of 2010 and the beginning of 2011) with real estate market experts in Estonia (see Table 51 and Table 52). In market rent estimation, the most typical type of market rent level has been used – namely, the level I net rent type of market rent (i.e., a rent, where the contractual rent contains all fixed costs – land tax, building insurance, management and maintenance costs, as well as other costs are paid by the owner).

In model 4, it is assumed that the assets are first transferred to RKAS, who rents the space in the pre-sale stage to the state for the market price, which takes into account the existing quality of the space without any investment obligation (see Table 51) and thereafter, the pre-sale stage of space is disposed of gradually, during a 5-year period, to the private sector. After that a new market-level rental contract is made (only optimized space is newly rented back by the state), which takes into account also the obligation to make capital investments (see Table 52).

Table 51. The estimated market rent for GPP of RKAS in model 4 (at the beginning of year 2011, EUR/m²/month).

Region	GPP of RKAS		
	Office/Accommodation	Educational/Social	Warehouse/Garage
Tallinn	6.39	5.75	1.60
Tartu	3.83	3.20	1.28
Other	2.24	1.92	0.64

Source: experts' opinions, compiled by the author.

In model 3, it is assumed that general-purpose assets are transferred to RKAS, who rents the whole set of transferred buildings back to the state with rent on the market level taking into account the required capital investment obligation. The situation is similar to model 4, where the asset is disposed of to the private sector. Therefore, the market rent data presented in Table 52 can be applied both to RKAS in model 3 and to the private sector in model 4.

Table 52. The estimated market rent for RKAS in model 3 and the private sector in model 4 (at the beginning of year 2011, EUR/m²/month).

Region	RKAS GPP / Private sector		
	Office/Accommodation	Educational/Social	Warehouse/Garage
Tallinn	7.67	7.03	2.24
Tartu	5.11	4.47	1.60
Other	3.52	2.56	1.28

Source: experts' opinions, compiled by the author.

Hereby, it should be remarked that according to real estate market experts, the level of market rents at the moment of their estimation was undervalued in a sense that at the beginning of year 2011 (i.e., the starting point of the cash flow estimation) the real estate market did not take into account the actual requirement of capital investments in their market rental levels. Unfortunately, it was not possible to identify empirically the exact amount of the capital investment component in the market rent because of the lack of the relevant data. Also, real practice in RKAS showed that in spite of the state requirement to switch over from cost-based rent to market-based rent in terms of GPPs, RKAS were still holding on to the cost-based rent model in all cases. The transfer from the cost-based rental model to the market-based rental model was obstructed because of the market rent level being so low that it did not cover the real costs associated with the state real estate assets.

Within this thesis, market expert opinions and forecasts about the possible market rental growth in the future have not been used. Instead, taking into account the functionality and, for simplification, in deriving the cash flow for fiscal impact analysis in PREAM models, the market rent adjustment has been done using a long-term estimation of the CPI.[53] The practical reason for choosing such an approach is because so far, as known to the author, there is still no mathematically proven method for composing an exact long-term forecast for real estate related market rents and also for market value. Therefore, the CPI-based adjustment approach (regarded as being the most conservative) has been chosen in both cases. In addition, in their market rent forecasts, the market experts do not take the growth rates of different components within the market rent (e.g., the components of owners' revenue, maintenance costs, periodical repair costs, capital expenditure costs) into account separately. Therefore, neither market rent components nor their possible future growth rates are identifiable because of the limitations of information available in the real estate market.

During the analysis, the author was aware that because of being in the exit-phase of a sharp decline period in macro- and microeconomic indices (referring to the recession of 2007–2009), the demand for and supply of space in the market did not reflect the average balance of the whole 30-year cash flow at the very beginning of the forecasting period. In addition, the long-term real estate market forecasts are influenced also by demographic trends and employment forecasts.

In addition to the problems with capital expenditures and growth rates in the context of market rent[54], the following should be outlined: in model 3 state real

[53] It is known from the private sector that many real estate related lease contracts contain the CPI-adjustment condition for lease payments. Therefore, in case of high inflation, the growth in lease payments is bigger than in times of lower inflation periods. Generally, also the real estate related costs follow the adjustment according to the inflation rate indexation.

[54] Similar kind of problems are identified in their papers by Verbrugge (2008) and Garner *et al*. (2010) in researching the issues of user cost of capital, which is elaborated more thoroughly in the methodology part, in sub-chapter 2.5.2.

estate assets are given over to RKAS with a non-cash payment (essentially free of charge), i.e., RKAS bears no additional expenses for obtaining these assets. Although RKAS has the obligation to earn ROE in at least 7%, then it is known that the net income of RKAS is not taken from GSA and during the next year it is possible to pay out dividends to the state budget (i.e., there is a one-year lag between the RKAS earnings and the paid dividends). At the same time, a private investor has to make an initial capital investment in acquiring state real estate. Assuming that the level of all the other costs is the same for RKAS and for the private investor, then in practice the rent level of those assets in EUR/m^2 should differ by the required rate of return (i.e. equivalent to capitalization rate). In case of using rental payments of equal value, in one extreme case the whole required return part of the rental payment paid to RKAS stays within the government sector and in the other extreme case the private investor does not earn any yield from the invested capital.

To summarise the previous discussion, then it can be concluded that a market-based rental payment should be used only if equal conditions of both types of lessors (RKAS or private investor) hold – i.e. there should exist a situation, whereby both of the lessors do not have to earn back their invested capital. In case of a long-term situation, such a scenario will definitely be accomplished in terms of acquiring the investment-purpose assets, since after a certain time, the investor will reach a point, where the initially invested capital will be earned back. In case of the current PREAM models, such equal condition does not hold.

Since the exact components of the market rent are not known, then:

1) the presentation of the yearly growth rate of market rent in a generalised form is only speculative, which distorts the results of the fiscal impact analysis (i.e. cash flow dynamics during the forecasting period);
2) it is not possible to model adequately the amount of the cash flow to GSA, as the different components within the market rent have a different fiscal impact on GSA (i.e. within the fiscal year, some of the components are accounted out from GSA, whereas some stay in GSA either entirely or partially).

Because of those previously described aspects, it is not possible to quantitatively compare market-based models to each other and also to cost-based models.

3.3.4. Input data for the estimation of fiscal impact in market-based models

The input data described in the following are directly connected to the calculations of fiscal impact to SB and GSA within the PREAM models. While the previous sub-chapter, 3.4.3, revealed the reasons, why it is complicated to draw out fiscal impact directly from market-based models, then the current sub-chapter describes some methodological input data, which help to convert the impact in an indirect way.

The main conversion data, which are defined specifically for this particular reason, are **cash flow rate and net income rate of GSA**, where:

1) cash flow rate expresses the amount of cash flow, which is paid by the state to RKAS and is not taken from the government sector account (i.e., it is staying within GSA);
2) net income rate depicts that part of cash flow, which is taken later as a basis for paying out dividends (i.e., it is a rate that is used in combination with gross dividend rate variable).

In case the manager of the state real estate is the state itself, the whole amount of money paid for investments and periodical costs are taken from the government sector. While taking into account the later tax transfers back to the state budget and also to the GSA, then it is not possible to treat the outgoing money as conclusive. Because of the limitations of the current research, those parts of cash flow, which are taking place within the society, are not dealt with in the present thesis.

On the other hand, in these cases, when RKAS offers some management services to state real estate (in model 2 and model 4) or is the owner of state real estate assets (in model 3), then part of the paid out money for investments and periodical costs stays within the GSA because of RKAS, which is a part of the government sector. The latter is connected to the fact that RKAS is a profit organisation and the input data used within the current analysis is meant only to that type of organisations.

In case of services, the cash flow rate expresses that part of the cash flow that stays in the government sector after the payment of the service-related costs. According to common practice, most of the services are provided from outside of the government sector and therefore, such kind of approach has been chosen also in the cash flow calculations for PREAM models in the current thesis. The basis of the net income rate has been taken to be 5.3%, which is the arithmetical average of the operating margin from sales revenue of a subdivision of the Estonian administrative and ancillary activities sector (i.e. maintenance of buildings and terrain) in 2005–2009. Service-related net income rate and cash flow rate are seen as equivalent to each other, as from the state point of view RKAS is only in the role of a service-mediator. It has also been assumed that during the whole cash flow forecasting period, there is no need to hire additional personnel in terms of the provision of services, connected to the state real estate assets.

In special-purpose properties model 3, where rental payments include, besides the components of maintenance costs and periodical repair costs, also a capital component (comprising the return of equity of RKAS), the above-mentioned rates are incorporated separately to the model because it is hard to draw a direct connection between those indicators. At the same time, in terms of services, the same rate levels in all four special-purpose PREAM models have been used. The same rate (5.3%; both as net income rate and cash flow rate) has been used also in general-purpose properties' market-based rental models (in model 3 and model 4), as because of the lack of statistical information over the

market rental payment components, it is not possible to calculate those rates adequately based on real data. Although, intuitively it is possible to assume that in general-purpose properties model 3 the amount of cash flow staying within the government sector has to be essentially bigger than in model 3.

In a broader sense, net income rate and cash flow rate are directly influenced by the operating efficiency of RKAS and it would be extremely hard to objectively forecast those data per every year during the 30-year period. Therefore, the most reasonable way was to use the same rates over the entire prognosis period.

Gross dividend payout ratio (dividend rate). Dividend rate indicates the share of net income of RKAS that is paid out to state as dividends. During the period 2005–2009, the average dividend payout rate was 41.62% and as in the context of state-directed cash flow, then it would be appropriate to use gross dividend payout ratio (i.e. the dividend-related income tax is received by the state). Thus, within the current research, 52.7% has been used as RKAS dividend rate. It should be remarked that in reality the respective indicator is directly influenced by yearly political decisions made by the government over the amount of needed dividend payments.

Capitalization rate. Capitalization rate is a yield rate, which is important in the case of disposition of state real estate assets to the private sector. Principally it is a private investors' required rate of return or a fraction from disposed assets, found by dividing a real estate asset's net operating income with its market value. In the current research, the capitalization rate is used for calculating the amount of yearly rental payments only in those cases of GSA fiscal impact modelling, where a financial lease contract is assumed (alternatively to operating lease). In those calculations, a 10% capitalization rate is used.

Value added tax (VAT) and the returning part of VAT to state budget. A 20% VAT rate has been used and under the returning part of VAT to state budget that part of VAT, which is paid back by service providers outside of the government sector is considered. Although, in practice most of VAT will return back to SB, as there is an obligation for service providers to make a VAT payment (subtracted by the input VAT), then the fiscal impact is modelled according to the assumption that there is no return (0%) from VAT to SB. The reason for that kind of approach stems from the basic structure of the research, where fiscal impact is treated only up to the moment of leaving the government sector. The later transfers, appearing outside of the government sector, are not considered.

3.3.5. Estimation of opportunity cost of capital for PREAM models

Considering the suggestions from the literature, discussed also in the methodological part of the dissertation, then in order to make PREAM models comparable to each other, there is a need to discount the forecasted cash flow from the set of state real estate assets to the present value with a discount rate suitable

with the risk levels of these cash flow streams. As it was discussed in theoretical part of the thesis, CAPM model for assessing the appropriate discount rate is preferred both by scholar and practitioners. E.g., CAPM is used in case of companies subject to price regulation in Estonia[55] as well as in other countries (Jenkinson 2008). In addition, the required rate of return for Estonian government-owned real estate company Riigi Kinnisvara AS (State Real Estate Ltd) has also been calculated using CAPM[56].

However, in PREAM models, every year during the forecasting period state real estate assets generate a negative cash flow to the SB and GSA. As the only basis for the analysis of the PREAM models is to compare the sum of discounted present values of these negative cash flow streams, an appropriate discount rate for each model should be found in order to make them comparable to each other. Due to the fact that fiscal impact on GSA is essentially cash-based and not accrual-based, it is possible to take GSA-related cash flow as the basis for the comparison. In principle, negative cash flow can be covered either by the positive components or by taking a loan by the state. Therefore, it would be reasonable to assume that for the discounting of cash flow, the appropriate discount rate[57] should be the cost of the state loan[58] as a proxy to opportunity cost of capital under the assumptions of PREAM models.

On the state level, the most suitable approach to the cost of state loan would be the market yield rate of long-term government bonds. As the Estonian government has not issued any long-term bonds, then an assessed level of cost of loan (k_D) is used. This level is calculated using German (and for comparison also USA) long-term (i.e., 10-year) government bond (T-Bond) yields (R_F^{GER}, R_F^{US}), taking also account the Estonian country risk premium (RPP_{EE}) and an additional component for reflecting flotation costs (FC) accompanying the emission of bonds. In a simplified way, the formula for assessing the cost of state loan (based on German T-bonds) can be expressed in the following way (see Formula 20):

$$k_D = R_F^{GER} + RPP_{EE} + FC. \quad (20)$$

[55] See e.g., Estonian Competition Authority instructions for weighed average cost of capital (WACC) calculation. [http://www.konkurentsiamet.ee/file.php?17216]

[56] Estonian Ministry of Finance report about share administration, founder and member rights execution in 2009. [http://www.fin.ee/doc.php?106032]

[57] The theoretical discussion over and argumentation about the appropriate discount rate for public sector budgetary purposes are given in sub-chapter 1.4.

[58] One should be rather cautious, when discounting negative cash flow and making conclusions over the obtained results. In case an action brings along only negative cash flow, the classical approach to discount rate (i.e., higher uncertainty associates with higher discount rate) may imply to the situation, where a smaller present value of expected costs in terms of such action plan is gained, where the expected costs are every year higher than for the alternative action plan. Therefore, in that case – with bigger uncertainty in negative cash flows it would be more appropriate to use lower discount rate or for simplicity to use risk-free rate of return in terms of all action plans.

If the assessment of the cost of Estonian state loan is based on USA T-bonds, then the formula should be adjusted for the expected change in future exchange rates (CRC) of EU and US currencies (EUR-USD) as follows (see Formula 21):

$$k_D = R_F^{US} + RPP_{EE} + FC - CRC. \quad (21)$$

According to the classical approach, the formula for deriving the yield to maturity of a bond is the following (see Formula 22):

$$V_b = \sum_{t=1}^{n} \frac{\text{Interest payments}_t}{(1 + R_{YTM})^t} + \frac{\text{Principal payment}}{(1 + R_{YTM})^n}, \quad (22)$$

where V_b denotes the market value of a bond.

As the yield to maturity (YTM) of T-bonds in two years before the analysis period was lower than average, then a longer historical period for the estimation has been used, to add greater adequacy and consistency in discounting the forecasted cash flow for 30 years. The historical average (between 01 October 2000 and 01 October 2010) yield to maturity for a 10-year US government bond was *ca* 4.35% and for a German government bond the same rate was 4.02%. On the other hand, while taking into account the historical average yields of these bonds since 1990, the figures were over 5.4% and 4.7%, respectively.

There are several kinds of methods for the estimation of country risk premium (RRP_{EE}). The present empirical analysis is based on the Estonian credit rating in 2011 (which was A1 at that time of research) and also on similar kinds of country credit ratings, comparing with the bonds of AAA-rating countries. In modelling cash flow, it was assumed for simplicity that in case the amount of state loan stays within the range of the Eurozone limits, then it does not entail any change in credit rating and in country risk premium.

The historical average risk premium for a A1 level of country risk rating at the beginning of 2011 was 0.97%. Risk premium, which is based on country risk rating, has also some shortages. Firstly, the rating agencies may not react fast enough to the changes in risk level; and secondly, the government may have options to lend the money on better terms than the general market interest rate (e.g., from international investment banks). Possible alternatives for assessing the country risk premium would be:

- Using market quotations of credit default swaps (CDS), although the CDSs of the Estonian government are such contracts that do not have the underlining assets (i.e. government bonds). The quotations of CDSs react considerably quicker to the changes of risk level than credit rating does, but at the same time, it is essentially more influenced by the emotions of market participants.
- The average difference of quotations of Talibor and Euribor, but here is the problem in short-term time-frame of interest rates and that the spread of quotations of Talibor and Euribor entails also the currency risk premium,

which is not relevant any more, as Bank of Estonia stopped the quotation of Talibor on 01 January 2011.

In addition to the compensations paid to investors, the cost of debt should include also the costs associated with the involvement of the debt (i.e., flotation costs, FC). According to the analysis conducted by Lee *et al*. (1996), based on companies quoted in the US stock exchange in 1990–1994, then the flotation costs of public emission of large-scale amount (over USD 500 million) of bonds for the private sector is about 1.6% from the amount of emission. It was hard to find a similar kind of analysis done about government bonds, but it is reasonable to assume that the flotation costs for government bonds are lower than for the private sector. While the flotation cost of 1.6% may raise the cost of short-term bonds considerably, the longer is the term of a bond, the less remarkable the influence of FC to the cost of the bond. For the undertaking of a long-term (10 years and over) debt in the form of bond emission, the accounting of FC would be even ignored, but because of the correctness of the analysis, an additional flotation component in the amount of 0.21% is used.

Accounting with the differences in exchange rates. In calculations based on yield to maturity (YTM) of US government bonds USD has been used as a base currency. At the moment of the empirical analysis (beginning of 2011), the yields of the dollar-based long-term instruments were slightly higher than the yields of government bonds in Eurozone countries similar to the US risk rating. In long-term calculations, it is reasonable to follow the condition of the interest rate parity, according to which the future exchange rate (F) differs from the spot rate (S) by the spread between the interest rates of two countries ($r_k - r_v$) in terms of market equilibrium. At the moment, when the real calculations were carried out (19 March 2011), the 10-year YTM of the US government bond was 3.27% and the YTM of German government bond was 3.19% (therefore, the difference was 0.08% per year). For the YTMs of German and US government bonds with the term of 30 years, the spread is already 0.78%. Therefore, the average spread is approximately 0.43% (i.e., CRC), which is used also in the calculations of discount rate within the current thesis (based on the interest rate parity condition), in order to equate the dollar-based discount rate analysis with the euro-based analysis.

Cost of debt for Estonia. While taking account the 10-year German government bond, it is possible to equip Formula 20 with the following data (see Formula 23):

$$k_D = 4{,}02\% + 0{,}97\% + 0{,}21\% = 5{,}2\% \quad (23)$$

The corresponding result for the estimation of Estonian cost of debt in those terms is 5.2%. At the same time, while taking into account the US government bonds and equip Formula 21 with the relevant data, the result would be the following (see Formula 20):

$$k_D = 4{,}35\% + 0{,}97\% + 0{,}21\% - 0{,}43\% = 5{,}1\% \quad (24)$$

In conclusion, it is possible to say that in the long-term perspective, the appropriate cost of debt for Estonia would be between 5.1% and 5.2% or 5.15% by average; whereas the same rate is suitable for applying as a discount rate in discounting the nominal free cash flow in PREAM models.

3.4. Fiscal impact analysis and its results in PREAM models

3.4.1. Fiscal impact and its analysis in PREAM models

In the following sub-chapter, the main aspects and general principles in the formation of fiscal impact on SB and GSA are described. Also, the main results of PREAM models are presented.

The main principles for the formation of FI on SB and GSA[59]. The main body of the empirical analysis within the current research is the analysis of fiscal impact, which is generated by the state real estate assets and directly affects SB and GSA. The aim of the analysis is to determine a PREAM model, which generates the least negative impact mainly on GSA, as the government sector takes into account both the state budget and the budget of government-owned company RKAS. The empirical fiscal impact analysis was implemented, based on the set of Estonian state buildings' cash flow models, which were developed and created, using the help of MS Excel software (aggregated into file "PREAMmodels.xlsx").

The basis for the fiscal impact calculations is the free cash flow (FCF) generated for SB and GSA according to the benefits and costs of each PREAM model (excluded in the financial lease-based model 4, where financial lease payments are based on accrual accounting). The yearly FI is the difference between the benefits and costs generated by state real estate assets (either owned and managed by the state or leased and outsourced relevant services). Although in the public sector the broader term "financial asset" instead of "cash" is used, then as the other sub-units of financial assets (e.g., securities, precious metal) are excluded from the current research, then the two concepts are treated as the same.

In every MS Excel-based PREAM model, the calculations of FI on SB and GSA have been given without any suggestions or solutions for possible sources for funds (i.e. the detailed approach to the financing side of PREAM models is ignored in the calculations). Negative FI determines the deficiency and positive FI shows surplus either in SB or in GSA. Hereby, it is important to stress that the borrowing of funds for covering for deficiency would influence both SB and GSA during the following years through additional interest payments, but in this thesis that part of the modelling has not been done.

[59] Based on "ESA95 manual on government deficit and debt: methods and nomenclatures" (2002).

State real estate assets, which have been transferred to the disposition of RKAS with non-monetary payments, have been treated in a way that by the amount of net cash flow (proceeds of sale minus cost of sale) received from the disposition of assets, the costs and capital investments to state real estate in that particular year have been lowered. Part of the money paid out by state to RKAS for services stays within GSA and part of it is paid back to the state via dividend payouts.

One of the relevant aspects to consider is that all PREAM models account only with incremental kinds of cash flow and other kinds of cash-flow (for example cash flow from the other operations of RKAS) has been ignored. Although the MS Excel based model allows modelling cash flow both with and without VAT, it is practically relatively difficult to say, how big the proportion of VAT is that is returned to SB via the payments for services made by state. On the other hand, tax transfers outside of GSA have not been included. Also, the income tax (mostly personnel-related taxes) from the private sector via services and sale of production has not been modelled.

In PREAM models, a similarity between the accrual-based and cash-based approaches has been assumed, i.e. all emerging costs are covered in the same year. According to the opinion of the author, the transfer of accrual-based costs to the next year does not have a substantial effect on the final results of the models and the conclusions made based on them. As follows, the main results of the fiscal impact analysis of PREAM models are presented.

Nominal fiscal impact during the 30-year perspective (see also Appendices 5–12). According to the description of the impacts given in sub-chapter 3.3.1, three levels of nominal fiscal impacts on GSA have been outlined. In order to ascertain the most appropriate model for state real estate management, the crucial factor is to verify the comparability of cash flow generated by the models under consideration. Although it would be technically possible to compare the models to each other by cumulatively summing up cash flow only for 30 years, then that kind of approach is connected to the following essential problems:

1) The ranking of the models may end up different when comparing the results from the shorter-term cash flow with the results from the analysis of long-term cash flow; i.e. it might be that the ranking of models made for a shorter period is not more beneficial than the ranking of models with long-term cash flow;
2) FI on SB and GSA is influence by the operational efficiency of RKAS, i.e. the models are sensitive to RKAS-related variables, which in turn may influence the ranking of models;
3) The ranking of models may be influenced by the level of FI – for example, the users of the real estate assets may pursue for a better result on the first (without transfers) level of FI (i.e., the level of cost and benefits of SB); for the central government it would be the best to gain a better result according to the level of FI on SB; and for the government sector as a whole, the goal would be to gain a better result on the level of FI on GSA.

From the named three levels of FI, the best approach for the public sector is reflected by GSA and therefore, for the ranking of the PREAM models, the method of discounted cash flow, directed to the government sector, has been used. An overview of the dynamics of the nominal forecasted yearly cash flow (both on the level of FI to SB and GSA) of the cost-based PREAM models (separately for general- and special-purpose properties, without IUS) is presented in Appendices from 5 to 8. Similarly, the dynamics of cash flow in market-based PREAM models (only for general-purpose properties, in model 3 and 4) have been presented in Appendices from 9 to 12. Nevertheless, it should be noted, that due to the obstacles described in sub-chapter 3.4.3, the dynamics of FI on SB and GSA during the 30-year period presented in Appendices 9–12, are not valid enough – their size (the scope) and dynamics during the perspective of 30 years is the result of the assumptions made about the models within the current research, input data and functionality of the MS Excel-based model; therefore these figures serve only as illustrative examples on one possible solution.

The fiscal impact of operating and financial lease contracts. In model 3 and model 4 an analysis based on operating lease and financial lease contracts was executed separately. In analysing the cash flow of operating and financial lease in model 4, it is worth to pay attention to the fact that in terms of financial lease, the whole rental payment during the lease period is reflected as a liability and also a negative impact at the moment of the lease, but in terms of operating lease, only a yearly rental payment in each particular year is reflected as fiscal impact. That kind of a situation creates a condition, whereby the negative fiscal impact on GSA is sufficiently bigger at the time of issuing the lease contract comparing to operating lease; but during the other years of the rental period, the negative impact of operating lease will be more significant. Therefore, the shorter is the lease period, the smaller is the difference between the fiscal impacts created by the use of operating and financial leases. At the same time, the total sum of fiscal impact is the same in both cases; only the timing is different. From the SB point of view, there is no difference in fiscal impacts between these lease contracts.

3.4.2. Results and comparative analysis of PREAM models

In order to ascertain the best solution for the management of state buildings, based on the fiscal impact analysis of four PREAM models, the most crucial aspect of the comparability of PREAM models arises. Resulting from the problem of market-based rent in general-purpose property models (see sub-chapter 3.4.3), it is not possible to compare cost-based (model 1 and model 2) and market-based (model 3 and model 4) models of general-purpose property to each other. At the same time, it is possible to analyse and compare cost-based general purpose properties (i.e., model 1 and model 2). Nevertheless, all the cost-based models of special-purpose property are comparable to each other. Therefore, the analysis has been done based on cost-based models of special- and general-purpose properties (model 1, model 2, and model 3) and relying

also on different scenarios of state buildings' classification (the set of RKAS buildings with a set of buildings according to the description of state institutions; and a set of RKAS buildings with a set of buildings according to the description of the Ministry of Finance), taking also into account the at least 30-year perspective.

The scenarios under analysis differed from each other by the inner structure or percentage share or amount of general- and special-purpose properties within the overall set of state real estate assets. More precisely – for example, in considering the total set of state buildings, the share of special-purpose properties according to the description of state institutions was 91.7% from the total amount of usable space and only 8.3% were classified as general-purpose properties (i.e., 2 112 615.70 m^2 and 191 299.48 m^2, respectively) (see also Appendix 2). On the other hand, according to the description of the Ministry of Finance, the respective shares were 74.3% and 25.7% (i.e., special-purpose properties – 1 711 700.00 m^2 and general-purpose properties – 592 215.18 m^2). Therefore, the common characteristic in both scenarios was the dominative proportion of special-purpose properties over general-purpose properties. But, while state institutions have followed a more conservative approach in asset classification, then the Ministry of Finance has viewed bigger potential in the disposition of state real estate assets.

- **Analysis of the set of special-purpose properties by models and scenarios**

For the basis of quantitative empirical analysis and for the comparability of special-purpose properties, calculations of discounted and summed up fiscal impact on GSA have been made (see Table 53), whereas the assessed level of cost of state debt has been taken to be 5.15% and has been used as a discount rate (see sub-chapter 3.4.5). Table 53 reveals that with the 5.15% discount rate, the least negative sum of discounted fiscal impact on GSA is generated by model 3 in both scenarios. This means that in terms of SPPs, the results of the calculations carried out in this research favour the situation, whereby the state should transfer all SPPs under the ownership and management of RKAS.

Table 53. The sum of discounted cash flow of special-purpose properties in model 1, 2 and 3 according to the used scenarios (EUR, without VAT).

SPP		Set of RKAS and the description by state institutions	Saving compared to model 1	Set of RKAS and the description by the Ministry of Finance	Saving compared to model 1
Sum of DCF	**Model 1**	-4 949 625 439.68	n/a	-3 997 161 532.19	n/a
	Model 2	-4 511 422 714.69	8.9%	-3 644 061 622.23	8.8%
	Model 3	-4 258 430 938.38	14.0%	-3 441 651 061.89	13.9%

Source: author´s calculations.

In assessing and analysing the comparability of the proposed PREAM models, it is possible to draw several conclusions. First of all, as PREAM models 1, 2 and 3 are all cost-based in terms of input data (variables), then the comparability between these models is guaranteed. In addition, due to a similar structure, PREAM models 1 and 2 are entirely comparable to each other, as model 2 is by essence a derivation of model 1. Still, while the only difference between model 1 and 2 is the returns to scale in the amount of 10% of management costs (maintenance costs and periodical repair costs), then model 3 differs additionally from model 1 and 2 by space optimization, which takes place because of the decreasing number of population and also the cost-based rental payment.

All the cost-based models are comparable to each other in terms of investment costs, as the data used as basis for the calculations (i.e. maintenance, periodical repair costs and capital expenditures) are the same in all models. From the financing side, models 1, 2 and 3 are also comparable to each other, as it has been assumed that financing takes place in essence by using equity capital (in models 1 and 2 from the state budget, but in model 3 from RKAS' budget). Similarly to models 1 and 2, the cost-based rental payment in model 3 also contains the components of periodical repair costs and maintenance costs. The main difference stems from the capital component, which is additionally taken into account in cost-based rental payment, being paid by the state to RKAS. The capital component in model 3 cost-based rent is derived from the sum of capital investment used in models 1 and 2, transformed into the annualised form; i.e. by essence, the investments are postponed or spread out to the future. In turn, the capital component in cost-based rent includes also the component of cost of RKAS' equity capital.

It is important to pay attention to the fact that while in models 1 and 2 all costs are adjusted accordingly to the expected and forecasted rate of inflation, the peculiarity of model 3 is that the capital component grows according to the cost of RKAS' equity, whereas the total sum of capital component is adjusted for the forecasted rate of inflation every year. The higher the discount rate used for discounting cash flow, the better off in the ranking of models model 3 would end up, in case the cost of unleveraged equity of RKAS (5.87%) used in capital component calculations stays unchanged.

Although in model 3 the state reduces the yearly burden by lowering cost-based rental payments, the total nominal cumulative sum of the yearly outflows during the 30-year period is still higher due to the capital component within the rental payment, as compared to models 1 and 2. In model 1 and 2, the expenditure during the first years (2011–2019) is higher (due to the extensive amount of capital investments) compared to the later ones, but in summing up the cash flow in nominal terms (without discounting), the expenditure still remains lower than in model 3. Nevertheless, the co-result of optimization, returns to scale, time value of money and other assumptions taken account within the research is that in summary the best ranking from all the cost-based models has been achieved by model 3 (see Table 53).

- **Analysis of the set of general-purpose properties by models and scenarios**

Because of the above mentioned, and in terms of general-purpose properties, only cost-based models have been taken under consideration in the analysis of discounted cash flow. As seen from Table 54, the least FI on GSA is generated by model 2 in both analysed scenarios.

Table 54. The sum of discounted cash flow streams of general-purpose properties in model 1 and 2 according to the used scenarios (EUR, without VAT).

GPP		Set of RKAS and the description by state institutions	Saving compared to model 1	Set of RKAS and the description by the Ministry of Finance	Saving compared to model 1
Sum of DCF	**Model 1**	-442 902 905.62	n/a	-1 326 913 849.62	n/a
	Model 2	-404 004 638.55	8.8%	-1 213 023 270.23	8.6%

Source: author´s calculations.

Similarly to the models of SPPs, model 2 is essentially the derivative from model 1 also in terms of GPPs, differing from model 1 only by the returns to scale of 10% in management costs (maintenance costs and periodical repair costs), generating thereby a smaller negative impact on GSA. The cost associated with financing is not separately taken into account and modelled. Instead, it has been assumed that the state real estate assets have been financed by the state budget or in principle by the equity capital.

- **The combined impact of special- and general-purpose properties by scenarios**

As it discussed earlier, it is not possible to execute combined fiscal impact analysis of special- and general-purpose properties in case of models 3 and 4. Alternatively, the result of the combined impact of special- and general-purpose properties as a sum of discounted cash flow only for cost-based models – for models 1 2 – have been presented according to the scenarios. Thus, according to the scenarios, Table 55 presents both SPP and GPP cost-based models 1 and 2. Here, it is clearly seen that the best result in ranking purely cost-based models, is achieved by model 2.

This means, that, as apparent from Table 55, and according to the sum of discounted cash flow, the lesser negative fiscal impact on GSA is generated by model 2 in case of both scenarios.

- **The fiscal impact of a sale and leaseback transaction on state budget**

In the frame of the current thesis, a separate analysis over the fiscal impact on SB was executed. This analysis considered the SLB transaction. A sensitivity of FI from the SLB transaction was analysed in terms of selling prices and

financial lease levels. The result of the analysis showed that remaining a tenant for a longer period (for example 30 years) is accompanied with negative FI on SB. In order to increase the positive effect, the state must be in the role of a tenant for as short a period as possible, dispose the real estate assets to the private sector for as high a price as possible, selling the assets as fast as possible or pay out lease payments as low as possible.

Table 55. The sum of discounted cash flow of special- and general-purpose properties in model 1 and 2 according to the used scenarios (EUR, without VAT).

SPP and GPP		Set of RKAS and the description by state institutions	Saving compared to model 1	Set of RKAS and the description by the Ministry of Finance	Saving compared to model 1
Sum of DCF	**Model 1**	-5 352 892 575.30	n/a	-5 284 439 611.81	n/a
	Model 2	-4 875 791 583.24	8.9%	-4 817 449 122.46	8.8%

Source: author´s calculations.

3.5. Discussion over the results of fiscal impact analysis of PREAM models

In this sub-chapter, a summary of the fiscal impact analysis (FIA) on both state budget (SB) and government sector account (GSA) is given for each public sector real estate asset management (PREAM) model:

- FIA on SB and GSA in model 1 shows that all costs – periodical repair and maintenance costs – have a negative impact on SB and GSA; i.e., all costs associate with cash outflow. The only positive impact on SB and GSA in model 1 (and also in model 2, model 3 and model 4) is created by the disposition of IUS to private sector.
- FIA on SB and GSA in model 2 shows that all costs – periodical repair and maintenance costs and investments – have a negative impact on SB and GSA. As maintenance and periodical repair services offered by RKAS to the state are profitable and generate positive net cash flow to the company, then those costs have a positive impact on GSA. Also, RKAS dividends have a positive impact on SB. Income from the sale of real estate assets (in this case IUS) has a positive impact on GSA and SB.
- In model 3, the FIA on SB and GSA shows that the rental payment, paid by the state to RKAS, has a negative impact on SB in the payment year, whereas the part of the net profit within the rental payment is paid back to SB dividends during the following year. The same rental payment has a negative impact on GSA on the level of the amount of the rental payment that is taken from the government sector (after transferring it from the state to RKAS).

- In model 4, the FIA on SB and GSA shows that after the disposition of the real estate assets to the private sector, the state pays the market-based rent at first to RKAS, who in its turn transfers the rent to the private sector. Therefore, during the payment year, the rental payment has a negative impact on both SB and GSA. RKAS is here only in a role of a mediator, who earns a management fee from transferring state rental payment to the private sector. An important aspect is that public sector real estate assets are sold to the private sector in terms of a SLB transaction, where either finance or operational lease contracts are executed. These lease payments generate a growing negative impact on both SB and GSA. The disposition of the assets (also IUS) to the private sector has a positive fiscal impact both on SB and GSA at the same year when the disposition occurs.
- During the whole forecasting period (30 years and beyond), all PREAM models generate a negative fiscal impact to both SB and GSA. This means that in all cases – either owning or leasing the required space – the central government has to make investments into the real estate assets, which in turn need to be financed either from SB (using taxpayers' money) or by using debt financing.
- The scenario analysis revealed that the best scenario is based on the description of the Estonian Ministry of Finance due to a bigger amount of disposable GPPs. The result can be explained by the fact that according to the Ministry of Finance's description, the negative fiscal impact was lower during the first years of the cash flow forecast and therefore, due to the higher relevance of the first-year cash flow in discounting, the overall sum of DCF was also more favourable comparing to the description of state institutions.

In addition, several problems were detected in implementing the FIA on PREAM models using real-life data from practice. For example:

1. One of the most crucial questions behind the analysis of PREAM models was whether they are comparable. One of the main aims of the analysis was to detect a PREAM model that generates the least negative fiscal impact on SB and GSA. However, it is practically not possible to compare situations, which are theoretically not comparable.
2. The analysis was carried out under several constraints, discussed in subchapter 3.2.1. From the comparability point of view, it was a very important to assume that all of the PREAM models are equal in terms of the amount of the analysed space, and also in terms of the amount of investment and the form of financing.
3. Another technicality that arose during the study was the realisation that in order to make PREAM models comparable to each other, it is important to discount the forecasted cash flow into present value. However, overall negative cash flow streams make it complicated to compare the PREAM models to each other, as traditional perceptions and suggested methodologies over the application of the discount rate and the interpretation of the result of discounted cash flow streams do not hold in these terms.

4. Here, a crucial problem was to find an appropriate discount rate for the cash flow streams of all four PREAM models. One of the important questions to solve was to understand, whether the cash flow streams of all models are on the same risk-level, and therefore whether one identical discount rate should be applied or if the cash flow risk-level of each model is different and therefore a separate approach to the discount rate should be implemented. According to the author's findings, the risk-level of cash flow to GSA was the same. Therefore, a discount rate of 5.15% as a cost of state debt was applied.
5. The amount of cash flow to GSA is heavily dependent on the amount of the components of market rent left within GSA, which are unfortunately not exactly measurable due to lack of relevant data. Although that kind of problem concerns and influences fiscal impact directly only in model 3, then such a methodological gap needs to be filled in order to ensure the better comparability of PREAM models and therefore improve the validity of the results of the study.
6. The information for getting the exact numerical measurements of input data for the market-based models (especially for market rentals, but also for other market-based data) is insufficient.
7. There is no adequate basis for the forecasting of market rent at least for up to 30 years and beyond.
8. Based on the analysis done within this research, it would be very hard to give a concrete answer to the question, which of the four PREAM models would be the best for the state to implement. The main reason stems from the identified fact that because of the inequality of input data, the cost- and market-based models are not exactly comparable to each other, and therefore the only comparable models were the special-purpose property models, i.e., model 1, model 2 and model 3.
9. According to the sensitivity analysis, all PREAM models were sensitive to the discount rate applied to the forecasted cash flow to GSA.

Summarising the above said and taking into account the part of PREAM models that contain general-purpose properties, it is possible to conclude the following:

1. Due to lack of data, there exists an inequality between cost-based and market-based models and therefore they are not comparable to each other;
2. From the cost-based models (i.e., model 1 and model 2), model 2 turned out to generate less negative fiscal impact on GSA than model 1;
3. For the market-based models (i.e., model 3 and model 4), it is not possible to give any ranking of superiority based on the existing dataset, as:
   a. The implied components within the market rent (e.g., owners' gain, maintenance costs, periodical repair costs, capital investments, cost of capital) are unknown numerical numbers and there is a lack of available market information for the adequate recognition of their actual sum;
   b. The estimation of market rent level at the beginning of the analysis period assumes and takes into account the existing demand and supply for real estate in the market. This may be an insufficiently adequate basis for making the prognosis for the movement of the level of market rent during

the 30-year forecast and beyond. For that reason, no market simulation techniques have been applied in this analysis;

c. The cash flow rate of GSA (expresses the assumable amount of cash flow staying within GSA) depends largely on the precise sums of the actually existing components of market rent;
d. Due to the content of points a and c, there is an unsolvable iteration problem with unknown data, which affects severely the yearly sum of the cash flow streams flowing out of GSA. This makes the actual size of fiscal impact on GSA is unidentifiable.

Finally, a discussion of results, based on research questions and propositions, is undertaken. The combination of results from propositions 2–4 and research question 2b allow to answer research question 2a.

Table 56. Propositions 2–3 and corresponding outcomes.

Proposition	Outcome
Proposition 2: *State-performed centralised form of ownership combined with state-mediated centralised form of management of public sector real estate assets generates the least negative fiscal impact on government sector account.*	In a situation where a state owns a whole set of real estate assets, but its management has been given over to a state-owned company in the centralised form, means that the cash flow stream of this model is based entirely on costs (no benefits are assumed) and the advantage of that kind of model over others should be achieved only from the savings of management costs via the returns to scale obtained from the centralised form of management. Therefore, the bigger is the achieved returns to scale, the better is the final outcome, i.e., the lower is the negative fiscal impact on SB and GSA. The empirical analysis of the current thesis showed that in case of a set of special purpose properties, assuming 10% returns to scale without any space optimisation, the state-owned form of ownership and state-mediated form of centralised management presented a better outcome than a model with state-performed ownership and decentralised management. However, due to the lack of an additional assumption of optimisation, then comparing with the other models – state mediated form of management and ownership and also the privatisation model, the negative fiscal impact for the overall set of state buildings was higher.
Proposition 3: *State-mediated centralized form of ownership and management of public sector real estate assets generates the least negative fiscal impact on government sector account.*	The model-based analysis revealed, that the state-mediated form of centralised ownership and management of public sector real estate assets achieves the least negative fiscal impact when comparing the models only with the sets of special-purpose properties. This result was received due to the assumption of the presence of returns to scale and also because of the optimization of buildings' space. Unfortunately, under the sets of general-purpose properties, where the market-based approach was assumed, it was not possible to compare the state-mediated centralization model with the privatization model.

Proposition	Outcome
Proposition 4: *The disposition of public sector real estate assets to the private sector and leasing back the required space, generates the least negative fiscal impact on government sector account.*	Because of the potential political and security risk, SLB transactions with the private sector should be performed only concerning general-purpose properties. From that point of view – the bigger the disposable set of general-purpose properties, the higher the selling price of real estate assets; and the lower the contractual rent of leased back spaces, the better the outcome (i.e., lower negative fiscal impact on GSA) that would be achieved via the implementation of a privatisation model over the other models. On the other hand, central government has the tendency to sell its real estate assets with discount, i.e., below its underlining market value (comparing to institutional and non-institutional private investor; see Wiley 2012), which may undermine the preference of asset privatization model over the other models.

RQ.2b: *Whether and in which terms the elaborated four PREAM models ought to be comparable to each other in order to answer to the RQ.2a?*

Among the bundle of limitations considered with before the empirical study of PREAM models, there were some assumptions, which were extremely relevant to the comparability of PREAM models. First of all, for being comparable to each other, the models needed to be equal in terms of amount or sum of building spaces analysed in the models. Second fundamental basis for the comparability of the models is the assumption over the equal sum of invested capital and also equality in the mix of equity and debt capital financing in every model, i.e., it was assumed that capital investment expenditures and also financing are the same across the models during the cash flow forecasting period. Although the financing side of the analysis is not elaborated on in detail, it has still been taken into account in the assessment of discount rate and the cost of capital component, which was used in the calculations of the cost-based rental payment in the state-mediated centralisation model. Thirdly, considering both general- and special-purpose property, there was an assumption made that the purpose of use will not change during the whole forecasted cash flow period. The analysis revealed also the importance of knowledge about market rent components and their modelling in the future, all of which is essential for the reliable derivation of fiscal impact on GSA.

The BCA of PREAM models detected the overall negative fiscal impact as free cash flow to the government sector (balance) account. In order to compare the financial outcome of PREAM models, there was a need to discount the forecasted cash flow streams to the present value and sum them up. However, the author had to overcome a discounting paradox, as the suggestions taken from traditional finance theory about valuing and using appropriate opportunity cost of capital as a discount rate according to the overall risk level of the cash flows did not hold in terms of the overall negative cash flow stream. Instead of using different discount rates for different models, as it was suggested in the methodological part of the thesis, it was chosen to use the same level of discount rate for all models.

***RQ.2a**: Which form of management and ownership of public sector real estate assets generates the least negative fiscal impact on state budget and government sector account?*

In terms of special-purpose properties, the least negative fiscal impact on SB and GSA was achieved by the state-mediated centralized form of both ownership and management. In terms of general-purpose properties, it was not possible to achieve a clear answer because of the impossibility to identify the components of market rent, which is relevant knowledge in calculating the fiscal impact on SB and GSA from the state-mediated centralised model.

It is possible to apply a two-sided view on the question: either by considering the short-term or the long-term horizon. In a short-term view, cost-based models clearly underperform the market-based models, but in the long-term the cost-based models outperform market-based models. On the very fundamental level, in a very long-term basis, there is no difference between the PREAM models, as they are all equal to each other – both the cost-based and market-based. In other words – when the equality between the unit of user cost, rental price and real estate market value holds, all the PREAM models should be equal in terms of fiscal impact.

Source: compiled by the author.

CONCLUSION AND DISCUSSION

The sizes of countries (in terms of territory, population, income) are different, their traditions and habits vary, and therefore also the ways, how they handle their public sector real estate management is not the same. Still, there are a lot of common features, which are universal to bear in mind while making decisions over the use of taxpayers' money. Firstly, one common feature in every country is that the government administrates in terms and in the presence of budgetary constraint. Secondly, in every democratic country the public sector has been evoked to serve the interest of the citizens of that country. Government authorities need to make state-concerning financial decisions prudently, weighing carefully the consequences in executing different scenarios of action. Smaller countries like Estonia have fewer opportunities and scantier resources (both human and financial) to deal with the complex problems concerning large amounts of capital assets, and therefore decisions over public sector real estate issues need to be made even more diligently.

Since 1980s, many developed countries have adopted the New Public Management conceptual ideology in their management of public sector real estate assets. It has brought along some major changes in the ways of thinking within the governmental bodies and in how public sector real estate assets are handled. A major shift in the ways of thinking came about due to several reasons. Mostly, it was derived from the understanding (following the overall trends in the private sector) that by large, real estate assets for the public sector are an essential cost-centre for the state budget and something significant must to be done in order to reduce the burden on the taxpayers' money. On the other hand, some governmental bodies viewed public sector real estate assets as an easy way to alleviate a possible budget deficit. In a way, this dissertation points to the possible restrictions in the application of New Public Management concept in the context of public sector real estate, encouraging to discuss over prudential asset management on the state's level.

The current thesis contributes to the theoretical, methodological and empirical part of investigations on PREAM. Firstly, a theoretical conceptual framework was developed; thereafter, an appropriate methodology was chosen (i.e., a derivation of a description of PREAM models); and finally, a quantitative empirical analysis method was developed to test the qualitatively described PREAM models, based on the previously framed theory and methodology in order to draw conclusions and find answers to research questions and propositions.

The main conclusion made within the current paper is that PREAM models derived from the concept and similar kinds of models used in the private sector, in CREM, are well-applicable also in the public sector practice. Also, the main conclusion made based on the implemented fiscal impact analysis conducted in the empirical part of the thesis, was suggested the application of PREAM model 3 for the SPP; i.e., according to the fiscal impact analysis results, a practical suggestion to the state would be to transfer all SPPs under the ownership and

management of RKAS. This suggestion is based on the fact that model 3 generated the least negative fiscal impact on GSA during the 30-year forecasting period and beyond. This means that from cost-based models, model 3 is the most preferable for implementation based on the analysis of the set of the state buildings of the Estonian public sector.

From all PREAM models, only model 1 and model 2 were entirely comparable to each other in terms of both general-purpose and special-purpose properties. Out of these two models, model 2 would be a better choice for implementtation, because of its lower negative fiscal impact over the 30 years and beyond.

Due to the inequality of the input data, it was not possible to make any certain suggestions in terms of general-purpose properties, mainly because of the problem of market-based rental payment and its presumed inner components. The general logic behind market-based data should be that – the more general-purpose assets the state is able to dispose of with the maximum market value following model 4, the higher is the benefit for the state and the less negative or the better is the fiscal impact on GSA. Also, this would equally have an effect of making model 4 more preferable over model 3. The number of GPPs or potentially disposable assets in model 4 depends on the classification rules of the assets into SPPs and GPPs, and also, most often it may depend on political preferences. Thus, it is important to bear in mind that although it is possible to set up certain kinds of very strict rules on how to classify properties into special- and general-purpose property groups, in the end, it is still a subjective matter for the state.

The author remains rather critical over the final results of the BCA of PREAM models. At first, before the analysis started, there was a vast array of assumptions made over the application of PREAM models. Secondly, during the empirical analysis, it was detected that the final results are heavily dependent on the quality of the PREAM models input data. The quality of data, on the other hand, is dependent on the general level of a government information system. In case of Estonia, the latter is continuously improving year after year. At the current state, based on the available input data, only cost-based models were comparable to each other; since due to data inequality, it was not possible to compare cost-based and market-based models to each other. The final conclusion made based on the PREAM model preference was that for practical implementation it would be better to follow the analysis based on single cases (building by building) and not in an aggregated form. Therefore, in making final decisions over PREAM models, the following should be taken into account:

1) the incentives of leasing from the state perspective, where the main question is – what is or are the motive(s) for leasing instead of owning real estate assets from the public sector's point of view in general and specifically from the state's point of view ; and
2) the individual properties of each public sector real estate asset separately, not in an aggregated form.

In summary, the present dissertation brought out the conflict between the different ways of public sector real estate management in a way that has not been seen before in relevant academic literature. The study shows, how different combinations of PREAM models may work together in financial terms – what are the actual empirical results of various scenarios, while there is a presence of real data. In a broader sense, the data indicates, in the economic scale, what is actually important within this issue. It can be stated that the result of the current research is an example of the realm, where the economic scale leads into the moral scale.

Often governments do not think over the issues of centralization and decentralization. Instead, governance is executed in many countries largely basing on habits, social and cultural norms, whereas also legislation plays an important role. But in terms of constraints of recourses, every country has to think about how to use these most effectively; and at the same time without lowering or diminishing the quality of the services provided to its citizens.

Managerial implications

According to the aim of public sector management, there is a need to choose and implement such a PREAM model that satisfies the needs in providing the services of public sector organisations in the most efficient way. On one hand, as public sector actions are assessed and viewed usually in the long-term perspective, the use of public sector real estate should also be planned in a forward-looking manner for the longer time-period, using inter-generational analysis (i.e., covering more than one generation), if possible.

The disposition of public sector real estate assets is executed for various reasons. Sometimes there are political-ideological reasons, but sometimes it is connected to much more pragmatic financial considerations of gaining benefits to the state budget. By selling real estate assets, a government can temporarily close on a gap in the state budget, but in a longer term perspective the privatization of assets may not give the wished positive economic effect in financial and also not in social terms. At the same time, there is uncertainty in the selling time and market price of the assets that are put in order of disposition. As the experience of Australia, New Zealand and other countries have revealed, the possible time of gaining from disposable real estate assets may extend even up to ten years. It may happen at times, when the situation in the real estate market is not favourable any more. In the meanwhile, the state has to make investments (operating expenses) in order to hold the disposable assets at least in a "normal" condition before the actual SLB contract is executed. By entering into a lease contract with the private sector, SB and also GSA will be automatically exposed to all the real estate market risks. The only way to protect SB, at least partly, against those risks is to set up the standard norm for the terms of the lease contract.

One of the main managerial implications of the current dissertation is the proposition of the methodology, how to implement the decision process for the evaluation of the PREAM in practice. For that matter, in Figure 35, a suggestion

for a methodological approach for the evaluation of public sector real estate management has been made. The core of the evaluation approach is a model-based study, which consists of four stages of action for the derivation of fiscal impact on SB and GSA. The evaluation process starts with a cluster analysis in the first stage, where the implementation of the classification of public sector real estate assets is executed as the initial action. The main aim of the cluster analysis is to identify and separate from each other general- and special-purpose properties. Thereafter, the second action in the first stage is the formation of different scenarios, whereby the general- and special purpose properties are distributed into various PREAM models. At the second stage, analysis of a lease contract should be made, if any. At the third stage, the gathering of benefit and cost data will be executed in order to draw out the fiscal impact on SB and GSA from each PREAM model. Ultimately, at the fourth stage, the final evaluation and decisions over the PREAM models are made, bringing together the results of the cluster analysis, scenario analysis and model-based DCF analysis.

There exist principal-agent problems in all PREAM models that need to be considered while making asset management decisions over state real estate.

Policy implications

In order to increase the transparency of the actions of government authorities, each country must make sure that the overall state real estate policy adopted by the country has been clearly stated. In the terms of limited resources, a state as an owner or a user, or both, of real estate assets must think about and weigh the possible solutions of how to implement the management of those asset that the state is tied up with for decades and sometimes even for over generations. First and foremost, governments have the moral obligation to do it in a well-considered and sustainable way in order to avoid government failure in the future.

Decisions have to be made mainly concerning the choice between centralization and decentralization of real estate assets management and the choice between owning and leasing the required space by the state.

Government authorities need to be careful in disposing of the public sector real estate assets in large amounts to the real estate market, as potentially large quantities of space made available to the private sector may threaten to "overflood" the market and artificially create an unhealthy competitive situation from the supply-side. This in its turn may lead to the dumping of market prices.

In addition – government authorities should be careful also with the transfer to market-based lease models. First of all because of security and political risks, but secondly also because afterwards the authorities would have no control over market rent formation, i.e. it increases the uncertainty in forecasting future costs of lease and complicates further strategic planning of the state budget.

Government authorities should carefully weigh the possible results and consequences while making decisions during the practical implementation of PREAM models. For example, in some cases the disposition of assets may be too short-sighted of a policy, as the revenue obtained through asset sale is only a

one-off deal. At that, the decision made with asset disposition is irreversible and so are the possible consequences. Or looking at another perspective – the best result, or the least negative fiscal impact on SB and GSA in PREAM model 4, is obtained, when market prices on the real estate market are high (entailing maximum level of short-term benefit from the sale of the assets) and the level of market rents are low (minimum long-term periodical cost for the state in leasing the required space). Unfortunately, on the other hand, those two situations rarely coexist and to hit on the exact right moment for SLB transaction of state buildings in fair market terms is very tricky. Instead, most often the real result might be the opposite and SB and GSA will end up under long-term pressure.

On the other hand, before implementing PREAM model 3, where the state centralizes ownership to a state-mediated company, an important question should be asked – is it possible that an independent government company is going to develop its own goals instead of governments', that might reduce the economic efficiency in managing the state real estate assets and increase therefore FI to SB and GSA? In case such an opportunity exists – which would be the possible measures (i.e., rules, legislation, regulations or other instruments) that might prevent the occurrence of a state-owned company acting in an inefficient manner?

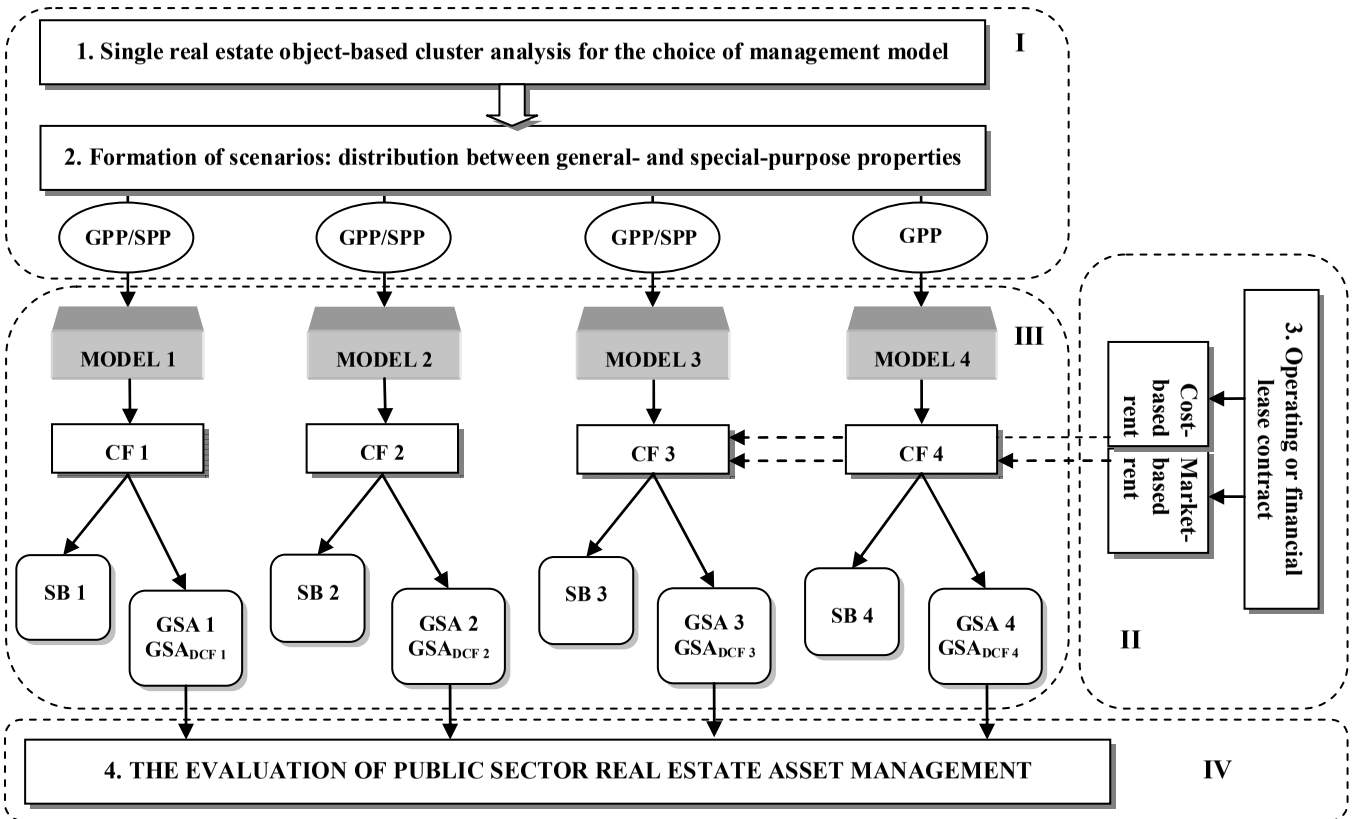


Figure 35. A suggested methodological approach for the evaluation of public sector real estate asset management (PREAM) (Source: compiled by the author.)

Theoretical background to developing the concept of evaluation for public sector real estate asset management models

The current research is the first attempt to contribute to the formation of a holistic theoretical view on PREAM. In forming the framework for the theoretical conceptual basis of the study, literature on various disciples were used, e.g., the literature on public administration and finance, real estate finance, corporate finance, corporate real estate finance, managerial and financial accounting, public sector financial management and accounting. Finally, the international best practice experiences were included for the formation of a theoretical basis. As a result, a combined overview of the connected base theories with their conceptual sources could be suggested, which resulted in the theoretical concept of PREAM.

Research methodology and data

The empirical research of the present dissertation was an exploratory study, conducted by using both quantitative and qualitative research methods; therefore, it embodied the elements of a mixed-method research. Due to the essence and the set up aim of the research, the main applied analysis method was quantitative; whereas qualitative research was used as a supportive method for additional essential data-mining.

The current dissertation revealed three main paradoxes, concerning the evaluation of PREAM models:

1) the evaluation was made under the constraints of heavy uncertainty, which can be overcome in the future only through the improvement of the quality of data;
2) the evaluation of PREAM models was executed, based only on the negative cash flow streams, which brought along the problem of finding an adequate discount rate to be applied to all the models; and
3) in order to be entirely comparable to each other, PREAM models should hold both conditions in point 1 and 2.

The current dissertation brought out the paradox of the discounted cash flow method in a context, which is usually not handled in literature on finance. Usually a discussion over the discounting of negative cash flow is elaborated on in terms of potential investment projects concerning PPP projects. But here the same problem arose, in discounting the cash flow of fiscal impact on GSA. From a mathematical perspective, a higher discount rate (compared to a lower discount rate) applied to negative cash flow results in a lower sum of discounted negative cash flow and therefore refers to a model with is seemingly higher in value.

Empirical findings and generalisations of the results

The empirical part of the dissertation shows how to implement the BCA method to the four possible real estate asset management models, applied to the set of central government buildings. The models differ from each other mainly by the form of property ownership and the way asset management strategy is implemented. The fiscal impact of potential costs associated with state real estate derives from a twofold basis – firstly, to the SB and secondly, also to GSA, considering at least a 30-year perspective in *pro forma* cash flow forecasts in both cases.

Although, the testing of PREAM models is made using the data of state buildings, on the basic level, there is no difference concerning the issues of central and local government real estate management. This means that, the same PREAM models can be viewed and applied both to the central and local management level, if needed.

The present thesis is one possible way of showing how to approach the PREAM problem. Consequently, the main conclusion made from the empirical part of the thesis was that, due to the inequality of the input data (mainly because of the quality issue), it was not possible to compare market-based PREAM models to cost-based PREAM models; and also market-based PREAM models to each other. Therefore, the main argument drawn from the empirical part of the dissertation is, that due to discrepancy in currently available data, it is empirically impossible to show the advantage of one PREAM model over the others; i.e. currently there is no valid argument to say that model 3 and model 4 possess a substantial advantage over model 1 and model 2. Finally, the choice over the best PREAM model would be to determine it, based on the analysis of a single object, not on the aggregated form.

The cash flow analysis in terms of negative fiscal impact on GSA revealed that it would not be possible to compare PREAM models to each other, based on the discounted cash flow, where the discount rate is calculated based on previously suggested theory and methodology of the thesis (i.e. a discount rate for each model should be calculated, taken into account the systematic risk of the cash flow from that particular model), as the result of that kind of approach may lead to wrong economic conclusions. Instead, the solution for the problem within the thesis was to apply the same discount rate for all PREAM models, which was by suggestion equalled to the expected cost of debt for the state at the time of the valuation date. The alternative solution was to apply a 0% discount rate for all PREAM models, i.e. calculate the sum of cumulative cash flow for the comparison of the models.

For clarification, the author needs to declare that the results of the empirical analysis of PREAM models presented within the current dissertation hold only in terms of the set up limitations and the input data that was used in the current research.

Limitations and recommendations for future research

The methodological limitations include deficiencies in the selected research methods. The validity and reliability of the chosen methods should be considered. In order to determine an increase in the accuracy of the research results, the author makes some suggestions for future research:

1. Additional empirical research should be conducted in order to solve the problems with market rent, which was left out from the present thesis due to the time limit. This means that, there is a need for a thorough investigation of the real estate market rent structure and it's forecasting in terms of fluctuating market conditions that the market participants have witnessed over the past decade and which influences also the public sector in a long-term basis in terms of market-based PREAM model 3 and model 4. Public sector exposure to the risk of market rent is a crucial issue in many ways and therefore it needs to be solved, using more precise and sophisticated modelling than has been used in the current thesis. Although there is a possibility to hedge the risk of market rent using strict terms in a leasing contract (especially in terms of rental growth rate during the lease contract period and also the length of the contract) either with RKAS or with the private sector.
2. There is a need for developing a proper modelling technique for the calculations of a yearly change in the amount of capital expenditures of public sector real estate assets, which is one of the main cost items for the state in terms of owning real estate assets. On the other hand, capital expenditure is also one of the main cost items within the cost-based rent in PREAM model 3 for special-purpose properties, owned by RKAS.
3. It could be explored, whether outsourcing within public sector entities is used as a measure for the implementation of cost reduction strategies.
4. There is need for additional exploration of risks: firstly, possible risks associated with the disposition of state real estate assets to RKAS and the private sector and the realization possibilities of these risks; and secondly, a separate exploration of risks concerning the implementation of different PREAM models.

For further methodological elaboration and future contribution, the author would suggest to:

- take fiscal impact into account also from the financing side of the PREAM models;
- consider the application and integration of the portfolio theory and real option value techniques to the evaluation of PREAM models;
- consider also the application of neural networks technique in long-term modelling of the benefit and cost input data of the PREAM models;
- test the applicability of computable general equilibrium (CGE) or applied general equilibrium (AGE) model on PREAM model analysis.

As the question of the appropriate discount rate still holds, then one of the research questions to study further would be, if at the long-run equilibrium

level, the cost of capital used to discount cash flow from public sector real estate assets should equal at least the average depreciation rate of the same assets. Also, an econometric model for the calculation of the equilibrium level of unit cost of capital of public sector real estate assets owned by the state and the market-based rent of those assets should be elaborated on in order to solve the inequality problem between market-based and cost-based models.

Summing up all the above said, the author would like to end with the proposal to include the prospect of social responsibility also in the research of PREAM and model through that a totally new discourse to the field of knowledge gathered so far.

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APPENDICES

APPENDIX 1. The base material for interviews conducted in Estonian ministries.

Dear respondents to the questionnaire,

The aim of the current interview and the corresponding questionnaire is to identify the criteria of when and why to prefer one PREAM model over another. Through the interviews, there is a task is to reach to a better understanding over what the most reasonable way of action in making a decision over PREAM models is and why; and to understand in a deeper sense the choices made, taking into account the arguments and explanations made by the representatives of public entities (ministries). For that, the following table has been presented in order to facilitate the answering with concrete examples. Hereby, there is a need to stress that it is not important to give a "right" answer, but rather to express the opinion and make suggestions.

In addition, as the State Assets Act states, the state assets are classified in all times into general- and special-purpose properties, we would like you to share your opinion over the possible criteria of the asset classification within those terms in the table.

NB! The following questionnaire is a part of main research; each result is considered as confidential and is meant to be kept disclosed. The results of the questionnaire are handled in a generalised form only.

Building data				Planned time of use			Who may be the owner (source of financing)?			Who may implement the following functions – (state/RKAS/private sector/ no opinion)?				Is there any alternative in the market?
	Name	Address	Useful area, m^2	Up to 5 years	5–10 years	Over 10 years	State (state budget)	RKAS (lease contract)	Private sector (lease contract)	Mana-gement	Develop-ment	Leasing	Priva-tization	yes / no
1	Building 1													
2	Building 2													
3	Building 3													
4	Building 4													
5	Building 5													
6	Building 6													
7	Building …													

Source: Riigi hoonestatud kinnisvara… 2011: 101.

APPENDIX 2. Capacity of the set of state buildings in Estonia (January 2011).

	Useful area (m^2)	%
GPP 1 (admin. estimation)	52 377.80	2.8%
SPP 1 (admin. estimation)	1 818 711.84	97.2%
GPP 1 + SPP 1*	**1 871 089.64**	**100.0%**
GPP 2 (Dep. of Fin. estimation)	453 293.50	24.2%
SPP 2 (Dep. of Fin. estimation)	1 417 796.14	75.8%
GPP 2 + SPP 2	**1 871 089.64**	**100.0%**
RKAS GPP	138 921.68	32.1%
RKAS SPP	293 903.86	67.9%
RKAS GPP + SPP**	**432 825.54**	**100.0%**
GPP 1 + RKAS GPP	191 299.48	8.3%
SPP 1 + RKAS SPP	2 112 615.70	91.7%
GPP 1 + SPP 1 + RKAS	**2 303 915.18**	**100.0%**
GPP 2 + RKAS GPP	592 215.18	25.7%
SPP 2 + RKAS GPP	1 711 700.00	74.3%
GPP 2 + SPP 2 + RKAS	**2 303 915.18**	**100.0%**
Surplus property	**219 998.10**	
Total portfolio	**2 523 913.28**	

* GPP 1 and SPP 1 are estimations of the classification of assets within the set of state buildings, where GP stands for general-purpose assets and SPP stands for special-purpose assets; whereas the same applies respectively also to GPP 2 and SPP 2 as the description of the classification of assets according to the Estonian Ministry of Finance.

** The set of RKAS buildings is given in net closed area, which is by average approx. 4.3% more than the useful area of the building.

Source: Estonian Ministry of Finance database of state assets (2011); Estonian state real estate inventory database (2009); compiled by the author.

APPENDIX 3. Classes of property, plant and equipment related to corporate real estate assets by companies' managements.

Type	Classification
1	Land
1.1	Land and Civil Works
1.2	Land and Site Improvements
1.3	Land and Improvements
1.4	Land and Leasehold Improvements
1.5	Freehold Land
1.6	Freehold Land and Improvements
1.7	Freehold Land and Land Improvements
1.8	Other Freehold Land
1.9	Distribution Land
2	Buildings
2.1	Freehold Buildings
2.2	Leasehold Buildings
2.3	Buildings and Leasehold Improvements
2.4	Buildings (including Leasehold Improvements)
2.5	Buildings (Structures)
2.6	Buildings (Fit Out and Other)
2.7	Buildings and Jetties
2.8	Other Freehold Buildings
2.9	Distribution Buildings
2.10	Generation Power Station
2.11	Harbour Improvements
2.12	Wharves and Hard Standing
3	Land and Buildings
3.1	Land and Buildings and Leasehold Improvements
3.2	Freehold Properties
3.3	Premises and Sites
3.4	Farm Land and Buildings and Improvements
3.5	Freehold and Leasehold Land and Buildings
3.6	Other Land and Buildings
4	Leasehold Properties
5	Leasehold Improvements
5.1	Communication Assets (including Leasehold Improvements)
5.2	Operating Lease Assets
5.3	Generation Plant (includes Land and Buildings)
5.4	Generation Assets
5.5	Finance Lease Assets
5.6	Capitalised Vineyard Lease Payments
5.7	Leased Assets
5.8	Distribution Systems
5.9	No Separate Class for Corporate Real Estate

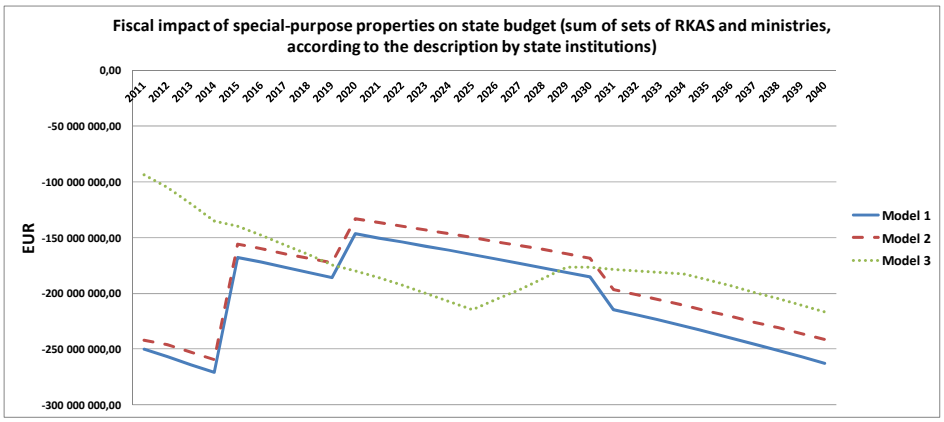
Source: Simpson and McDonagh 2010.

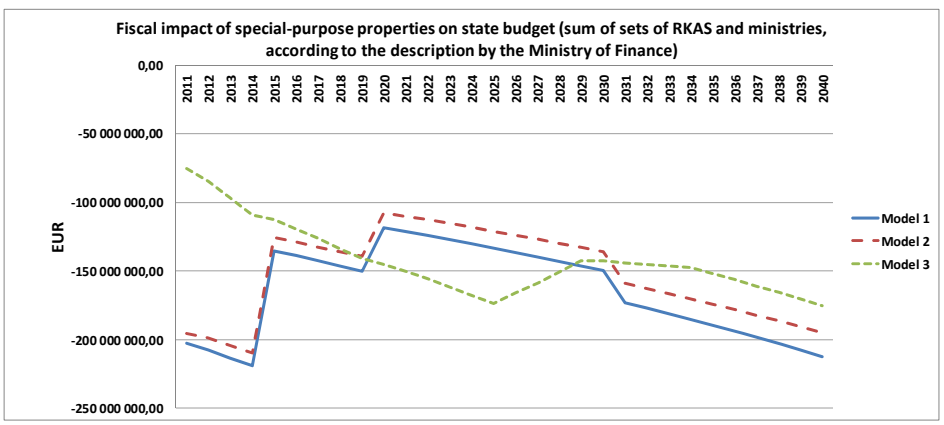
APPENDIX 4. Researches covering public sector real estate management by country case-studies.

Country	Author(s)	Year	Research area
Australia	Warren, C. M. J.	2002	public sector property strategies
	Brackertz, N.; Heywood, C.; Kenley, R.	2002	corporate real estate, facilities management, private sector, public sector, key performance indicators
	Scarman, I.; Kooymans, R.	2006	disposition of government assets, sale-and-leaseback, cost of capital
Canada	McKellar, J.; Gordon, D.	2007	disposition of publicly-owned real estate assets
	McKellar, J.	2006	management framework for government real property
	Jowett, A.	2006	public property information system
Croatia	Bertovic, H.; Kaganova, O.	2001	asset management in local government
	Grubišić, M.; Nušinović, M.; Roje, G.	2009	public sector asset management reform
Estonia	Liias, R.	2002 2007	facilities management standard, facilities management issues
	Reiljan, J.	2006 2007	public sector real estate policy
Finland	Leivänen, K. I.	2003	facilities services in municipalities, outsourcing
	Lindholm, A.-L.	2005	public sector facilities management services in local government
France	Bizet, B.	2006	state real property asset management
Germany	Schulte, K.-W.; Ecke, Ch.	2006	public real estate management
Hungary	Temesi, I.	2003	property devolution to local government
Indonesia	Hanis, M. H.; Trigunarsyah, B.; Susilawati, C.	2010	asset management in local government
Italy	Vermiglio, C.	2011	public property management in municipalities
Latvia	Linkaits, T.	2003	property transfer from state to municipality
New Zealand	Dow, P.; Gillies, I.; Nichols, G.; Polen, S.	2006	state real property asset management system
	Boge, K.	2010	outsourcing, public sector facilities management, public sector reform
Norway	Abdullah, S.; Razak, A. A.; Pakir, A. H. K.	2011	central government real estate practice
Malaysia	Regulski, J.	2003	management of property devolution to local government
Poland	Stanek, R.	2003	decentralization of public property

Country	Author(s)	Year	Research area
	Phelps, A.	2009 2011	municipal property asset management
Russia	Jókay, Ch.	2003	property transfer to local government, municipal property management
Serbia	Kling, J.; Pilát, J.	2003	decentralization of public property
Slovakia	Tonono, E.; Buys, F.	2008	public sector facilities management
South Africa	Mattson, H.-Å.; Lind, H.	2009	bridge maintenance, maintenance outsourcing
Sweden	Lind, H.; Lundström, S.	2011	owning vs leasing in public sector
	Andersson, R.; Söderberg, B.	2011	internal rents and ownership in state properties
	Lindqvist, T.; Lind, H.	2004	market versus hierarchical structures
	Lind, H. ; Lindqvist, T.	2005	public sector real estate management
Switzerland	Dafflon, B.	2006	real property management in local government
UK	Bond, S.; Dent, P.	1998	evaluation of efficient public sector asset management, public sector property valuation
	Andrew, A.; Pitt, M.	2004	governmental property appraisal
		2006	governmental property depreciation
	Phelps, A.	2009	municipal property asset management
USA	Hentschel, J.; Utter, M.	2006	municipal real estate asset management

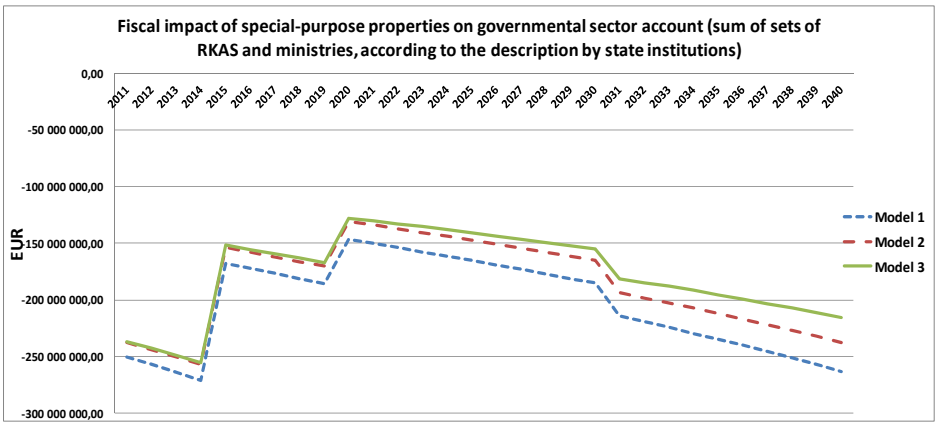
APPENDIX 5. Fiscal impact of special-purpose properties on state budget and government sector account during the 30-year perspective in PREAM cost-based models 1, 2 and 3.

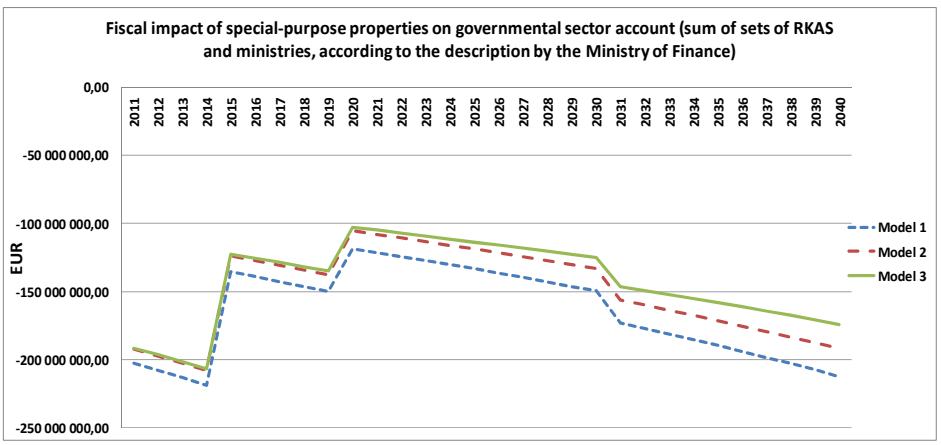




Source: author's calculations.

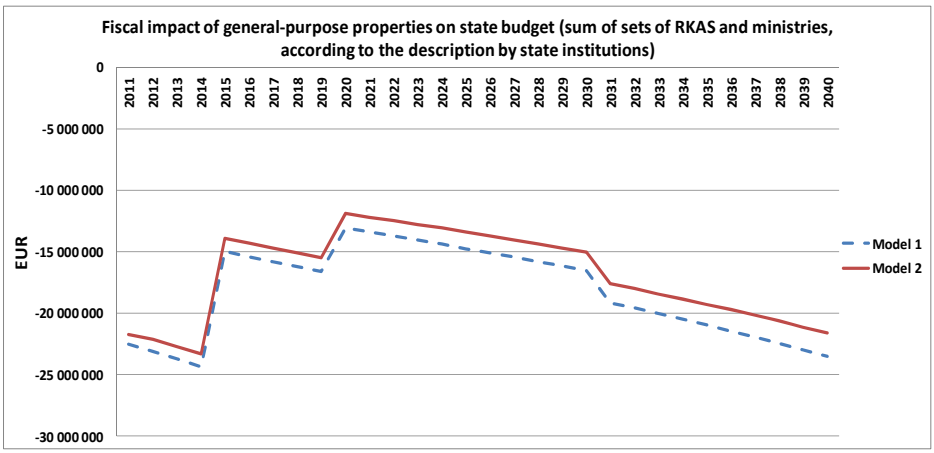
APPENDIX 6. Fiscal impact of special-purpose properties on government sector account during the 30-year perspective in PREAM cost-based models 1, 2 and 3.

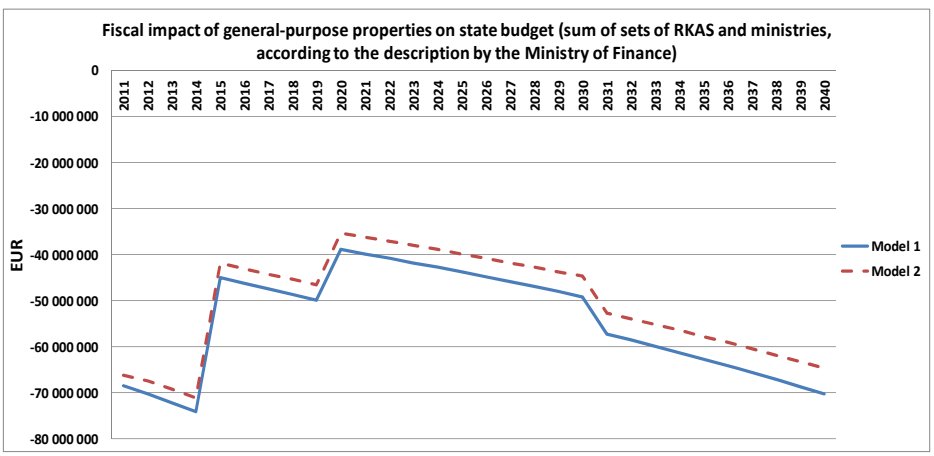




Source: author's calculations.

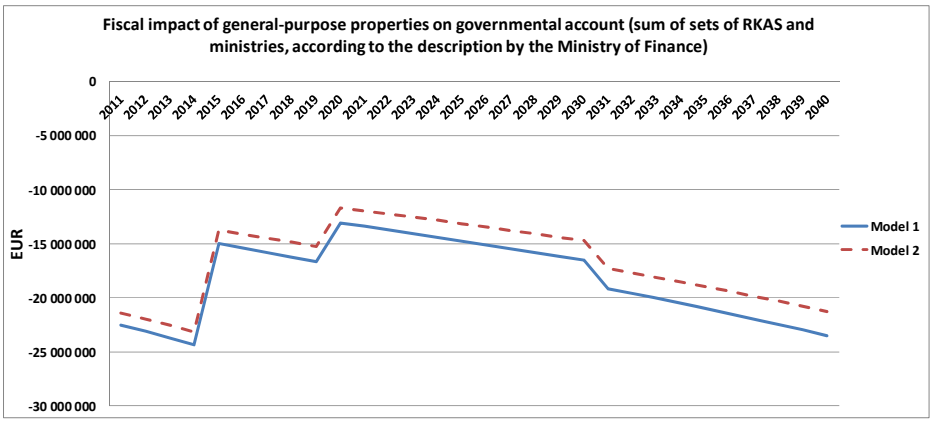
APPENDIX 7. Fiscal impact of general-purpose properties on state budget during the 30-year perspective in PREAM cost-based models 1 and 2.

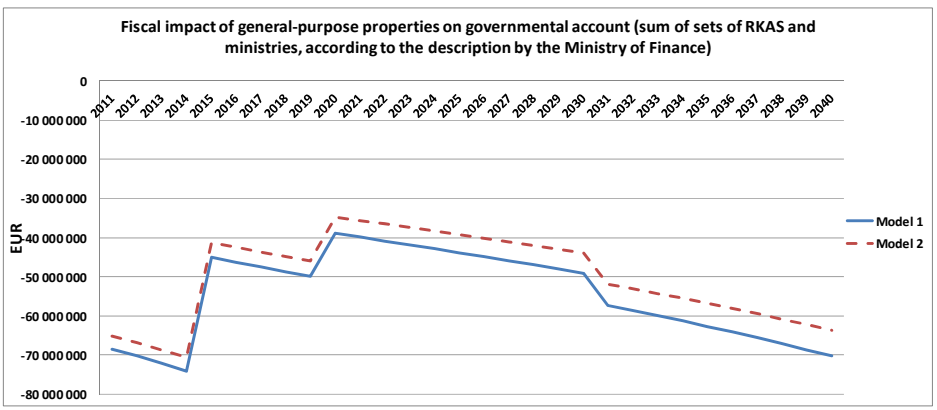




Source: author's calculations.

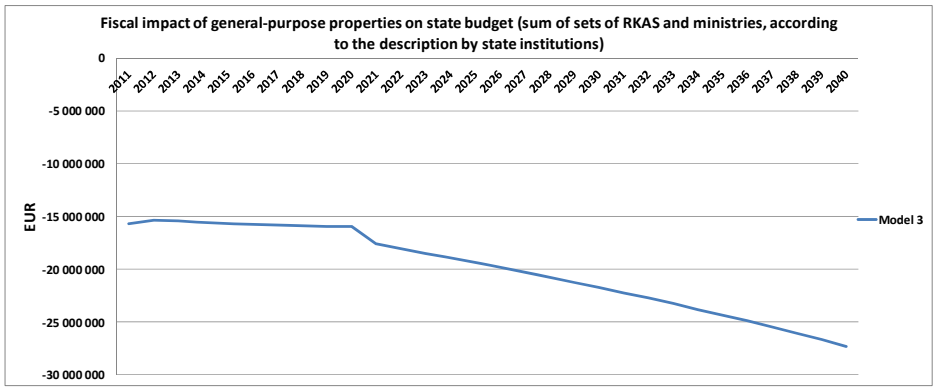
APPENDIX 8. Fiscal impact of general-purpose properties on government sector account during the 30-year perspective in PREAM cost-based models 1 and 2.

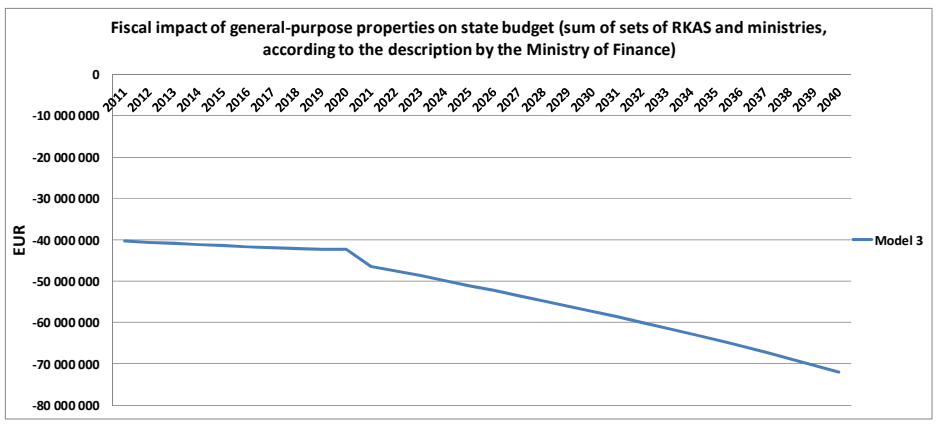




Source: author's calculations.

APPENDIX 9. Fiscal impact of general-purpose properties on state budget during the 30-year perspective in PREAM market-based model 3.

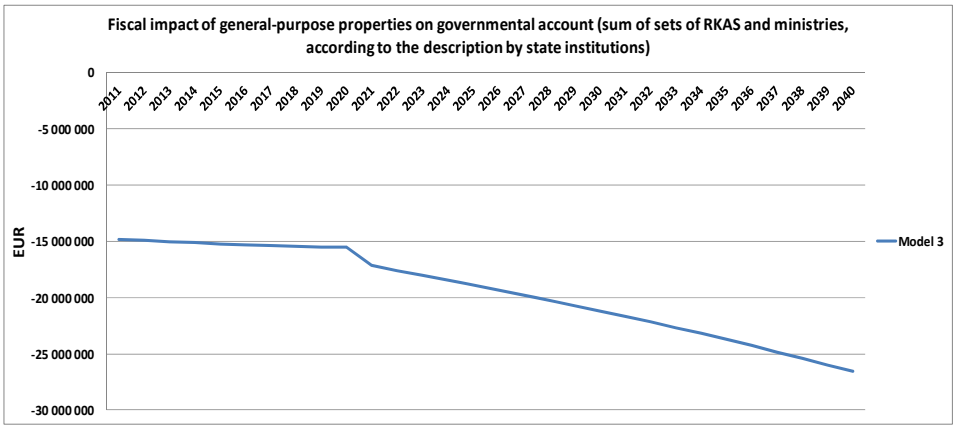


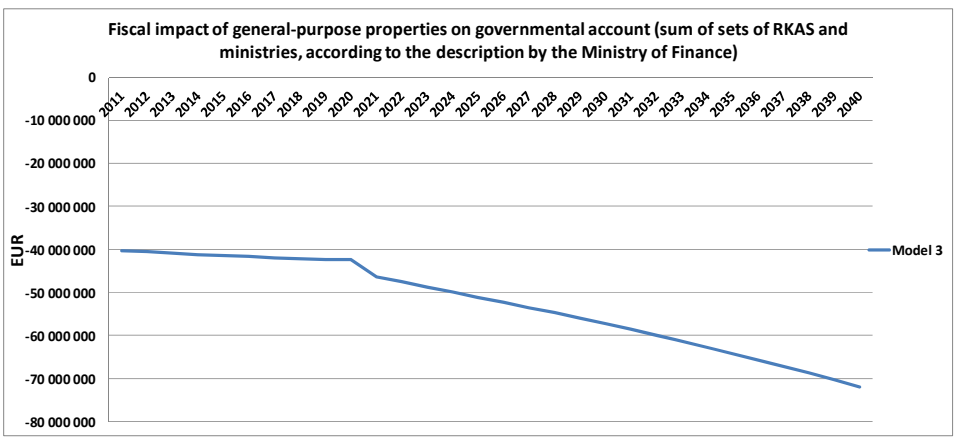


Source: author's calculations.

Relevant notification: The fiscal impact of general-purpose properties on SB in market-based model 3 is a derivation of the MS-Excel based model, where the result is dependent on the assumptions made over the model, on the currently used empirical input data, and on the functionality of the model; the presented size and dynamics of the fiscal impact may not reflect the actual result during the 30-year period of PREAM in Estonia.

APPENDIX 10. Fiscal impact of general-purpose properties on government sector account during the 30-year perspective in PREAM market-based model 3.

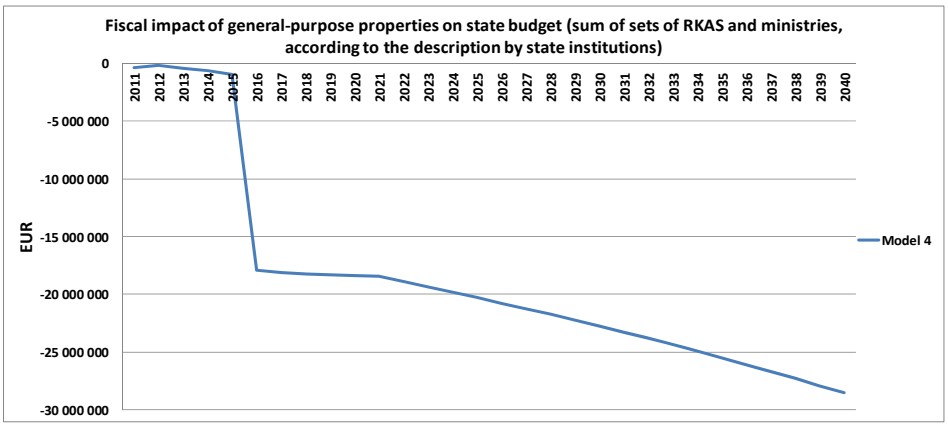


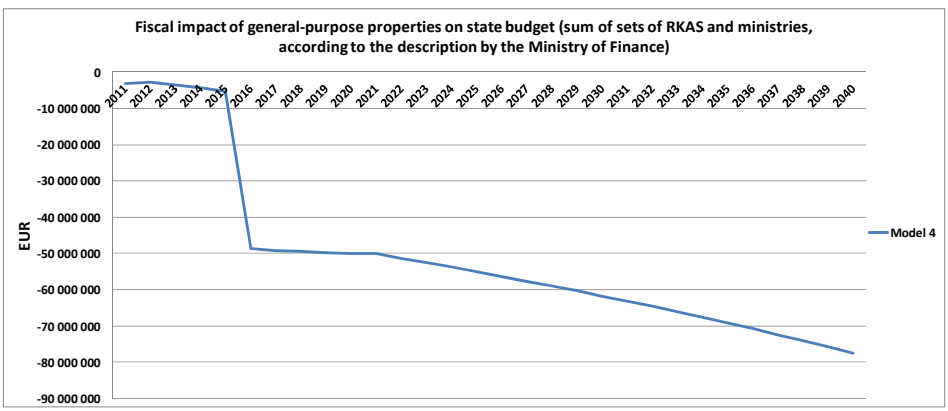


Source: author's calculations.

Relevant notification: The fiscal impact of general-purpose properties on GSA in market-based model 3 is a derivation of the MS-Excel based model, where the result is dependent on the assumptions made over the model, on the currently used empirical input data, and on the functionality of the model; the presented size and dynamics of the fiscal impact may not reflect the actual result during the 30-year period of PREAM in Estonia.

APPENDIX 11. Fiscal impact of general-purpose properties on state budget during the 30-year perspective in PREAM market-based model 4.

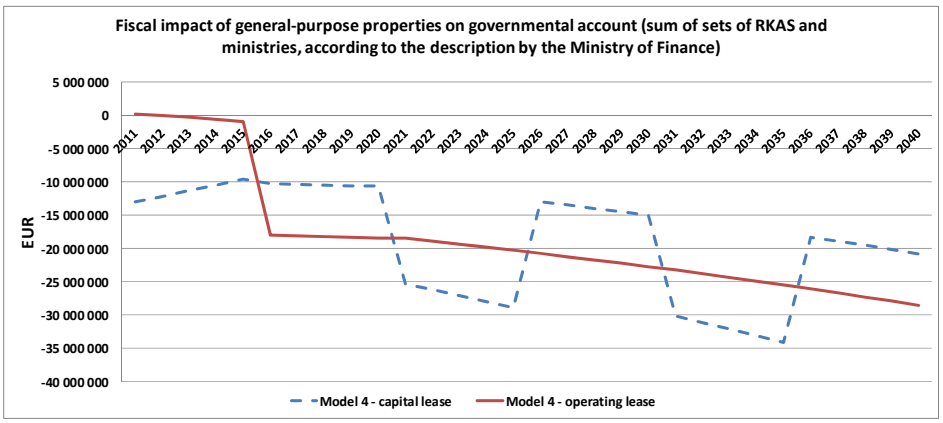


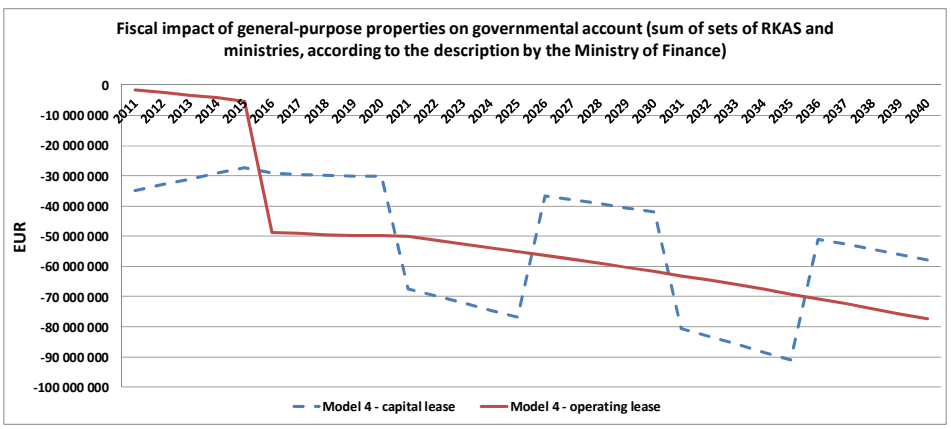


Source: author's calculations.

Relevant notification: The fiscal impact of general-purpose properties on SB in market-based model 4 is a derivation of the MS-Excel based model, where the result is dependent on the assumptions made over the model, on the currently used empirical input data, and on the functionality of the model; the presented size and dynamics of the fiscal impact may not reflect the actual result during the 30-year period of PREAM in Estonia.

APPENDIX 12. Fiscal impact of general-purpose properties on government sector account during the 30-year perspective in PREAM market-based model 4.





Source: author's calculations.

Relevant notification: The fiscal impact of general-purpose properties on GSA in market-based model 4 is a derivation of the MS-Excel based model, where the result is dependent on the assumptions made over the model, on the currently used empirical input data, and on the functionality of the model; the presented size and dynamics of the fiscal impact may not reflect the actual result during the 30-year period of PREAM in Estonia.

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SUMMARY IN ESTONIAN

Avaliku sektori kinnisvara varajuhtimise mudelid ning nende hindamine

Töö aktuaalsus ning uurimise motivatsioon

Enamikes riikides kuulub avaliku sektori omandusse märkimisväärses koguses kinnisvara, moodustades omaette eraldiseisva riigi kinnisvarakogumi, mille koosseisu võivad kuuluda nii passiivselt hallatavad varad kui ka aktiivses kasutuses olevad büroo- ja tootmishooned, samuti mitmesuguseid infrastruktuuriobjekte. Et otseselt kinnisvaraga tegelemine – selle haldamine, hooldamine ning muud taolised tegevusalad – ei kuulu otseselt riigi kui institutsiooni funktsioonide hulka, siis on loogiline eeldada, et riik peab hoolitsema selle eest, et kinnisvaraalane tegevus koormaks võimalikult vähe riigi peamiste funktsioonide täitmist, sh avaldaks võimalikult minimaalset fiskaalmõju riigieelarvele (SB) ning valitsussektori tasakaaluarvestusele (GSA).

Avaliku sektori kinnivarakorraldus pälvis suuremat tähelepanu esmakordselt Suurbritannias juba ligikaudu 30 aastat tagasi, kuid seisukohad selle teema olulisuse kohta on aegade jooksul tugevalt kõikunud. Laiemat huvi äratasid riigi kinnisvaraga seonduvad küsimused 1980ndatel, kui rahvusvahelisel tasandil hakati suuremat tähelepanu pöörama uue diskursusena tõstatunud uuele haldusjuhtimise (*New Public Management – NPM*) kontseptsioonile, mis soovitas erasektori ärijuhtimise põhimõtteid rakendada ka avalikus sektoris. Sellest mõttest kantuna hakkasid riigi kinnisvara puudutavate probleemidega põhjalikumalt tegelema lisaks Suurbritanniale veel ka USA, Rootsi ning Austraalia, Uus-Meremaa. Neist kahes viimati mainitus on valitsussektorit puudutavas kinnisvarakorralduses läbiviidud reformid olnud muude riikidega võrreldes kõige radikaalsemad. Suurimat tähelepanu on pälvinud riigi kinnisvarakorralduslik pool aga aegadel, kui nii majanduses üldiselt kui ka globaalsetel kinnisvaraturgudel on esinenud tsüklilist madalseisu, näiteks 1990ndate alguses ning ka viimatise, 2006. aasta järgse, majanduslangusega seonduvalt.

Tänapäeval on kõikide riikide jaoks olulisimaks küsimuseks – kuidas korraldada riigi kinnisvara majanduslikult kõige säästlikkumal moel, st kuidas saavutada kinnisvarakeskkonna ettenähtud kvaliteedi tase ja dünaamika madalaima kogukuluga. Sealhulgas tõstatuvad olulisemate teemadena riigi kinnisvarakogumi koosseis ja suurus ning sellest lähtuvalt riigile kuuluva kinnisvara liigitamine (milline osa olemasolevast kogumist on riigile oluline, milline vähemoluline), otstarbekus ning haldamisefektiivsus. Palju on võetud eeskuju ka erasektori parimast praktikast antud valdkonnas. Olulisemate strateegiliste aspektidena võetakse kaalumisele, kas on otstarbekam riigifunktsioonide täitmiseks vajaminevat pinda omada või rentida. Riigi kui institutsiooni spetsiifikast tulenevalt ei ole riigil võimalik täielikult loobuda teatud hulga kinnisvara omamisest. Seda tingivad peamiselt teatud julgeolekukaalutlused ning ka riigi jaoks sümboolset tähendust omavad tegurid teatud ajalooliselt väljakujunenud hoonete puhul, mil-

ledest loobumine võib anda väljaspoolt tõlgendatuna signaali kui võimalikust ebatervest olukorrast riigis.

Juhul, kui leitakse, et riigi seisukohast on otstarbekam teatud liiki pinda rentida, siis tõstatuvad küsimused, mil moel viia läbi riigi jaoks üleliigse kinnisvara võõrandamine ning uue pinna kasutuselevõtmine – kas olemasoleva pinna müügi- ja tagasirenditehinguna või võõrandada olemas olev kinnisvara ning lasta arendada uus ja kaasaegne, riigile paremini sobiv hoone. Mõlemal mainitud juhul kaasatakse tehingusse vähemalt ühe osapoolena ka erasektor. Vajamineva pinna rentimisel tuleb arvestada erinevate üürilepingust tulenevate aspektidega, millest olulisemaks osutub üürihinna olemus (kas turuüürist lähtuv või kuludel põhinev), selle sisemine struktuur (üürihinnas sisalduvad komponendid) ning selle dünaamika ajas.

Uurides avaliku sektori kinnisvarakorraldust erinevates riikides, võib täheldada, et valdavas enamuses on tegemist tugevalt detsentaliseeritud tegevusvaldkonnaga (UK), kus iga ametkond püüab leida ise oma haldusalas olevale kinnisvarale võimalikult optimaalset kasutust koos selle elukaarele omase haldamisega ning tsentraliseeritud kasutuskorraldust, kus kogu riigi kinnisvarakorraldus on koondunud ühe kindla, selleks spetsiaalselt ellukutsutud organisatsiooni (Eestis näiteks Riigi Kinnisvara AS – RKAS) alla, esineb suhteliselt harva. Tihti võib täheldada nii tsentraliseeritud kui ka detsentraliseeritud kasutuskorralduse üheaegset kombineeritud rakendamist (näiteks Rootsis, kus kinnisvarakorraldus on jaotunud nelja RKAS-sarnase asutuse kätte või siis ka hetkel Eestis, üleminekuperioodina). Kuigi kinnisvaraga seonduvad otsused tehakse enamikel juhtudel tugevalt poliitilistest kaalutlustest lähtuvalt, mis eri aegadel võivad olenevalt valitsevast parteist tugevasti muutuda, on vähemasti väitekirja autori hinnangul lootust, et eksisteerivad teatud ühise nimetajana esinevad universaalsed rahanduslikud kaalutlused, mille järgimisel on võimalik leida mõistlik lahendus kinnisvaraga seonduvate kulutuste minimeerimiseks nii, et ei kannataks riigi kui institutsiooniga kaasaskäivad olulised (staatust omavad) aspektid.

Uurimuse eesmärk ja ülesanded

Väitekirja eesmärk on töötada välja avaliku sektori kinnisvara varajuhtimise mudelid ning hinnata nende fiskaalmõju. Siinkohal tuleb märkida, et antud väitekirja raames viitab termin "mudel" kvalitatiivsete parameetrite (või tunnuste) kogumile, mis kirjeldavad avaliku sektori kinnisvara varajuhtimises kasutatavat teatud tüüpi stsenaariumit.

Eesmärgi täitmiseks on püstitatud järgmised uurimisülesanded:

1. Töötada välja teoreetiline kontseptuaalne raamistik avaliku sektori kinnisvara varajuhtimise uurimiseks.
2. Konstrueerida avaliku sektori kinnisvara varajuhtimise baasmudel (kirjeldades olukorda nii, nagu see hetkel on) ning sellega kaasuvalt vähemalt kolm võrreldavat varajuhtimise mudelit, tuginedes kvalitatiivsele uuringule.

3. Töötada välja metodoloogiline ning analüütiline raamistik avaliku sektori kinnisvara varajuhtimise mudelite hindamiseks.
4. Hinnata empiiriliselt avaliku sektori kinnisvara varajuhtimise mudelite fiskaalmõju riigieelarvele ja valitsussektori tasakaaluarvestusele, võttes aluseks Eesti riigi keskvalitsuse hoonestatud kinnisvara kogumi.
5. Esitada teoreetilise ja empiirilise uuringu tulemuste sünteesi ning teha ettepanekuid avaliku sektori kinnisvara varajuhtimise mudelite hindamismetoodika täiustamiseks.

Väitekirja peamiseks uurimisobjektiks on hoonestatud kinnisvara, mida riigi keskvalitsus kas omab, kasutab või käsutab.

Töö uudsus ja praktiline tähtsus

Doktoritöö originaalsus ja uudsus seisneb autori omapoolse panuse loomises avaliku sektori kinnisvara varajuhtimise nii teoreetilisse, metoodilisse kui ka empiirilisse käsitlusse. Avaliku sektori kinnisvaraalase akadeemilise kirjanduse uurimisel selgus, et peamiselt on teadlaste tähelepanu pälvinud erinevate riikide kohaliku omavalitsuse tasemel kinnisvarakeskkonna (*facility management*) kvalitatiivne uurimine ning tunduvalt vähem on käsitletud riigi keskvalituse tasemel kinnisvara varajuhtimisega (*asset management*) seonduvat. Akadeemilise erialakirjanduse läbitöötamise käigus ilmnes, et autorile teadaolevalt ei ole siiani ükski teadlane viinud läbi ja avaldanud avaliku sektori kinnisvaraalast kvantitatiivset uuringut. Sellest tulenevalt seisneb doktoritöö peamine uudsus riigi keskvalitsuse kinnisvara varajuhtimisega seotud mudelite loomises ning nende kvantitatiivses hindamises, tuues välja erinevate varajuhtimise mudelite (edaspidi ka varajuhtimismudelite) fiskaalmõjud, mille suuruse hindamine aitab viia parima riigi kinnisvara halduskorraldust puudutava praktilise lahenduseni. Enne vastava analüüsi läbiviimist loodi aga teoreetiline raamistik varajuhtimismudelite väljatöötamiseks, mis on doktoritöös esitatud kujul samuti uudne, võttes arvesse senist avaliku sektori kinnisvara puudutavat erialakirjandust.

Töö ülesehitus ja uurimismetoodika

Doktoritöö koosneb kolmest peatükist. Esimene ehk teoreetiline peatükk tõstab peamiselt esile uuritava teema komplekssust, tuues välja selle mitmetahulise olemuse läbi erinevate teoreetiliste käsitluste. Teoreetiline osa käsitleb avaliku sektori kinnisvara varajuhtimise mõistet, selle arengut, mitmetahulist olemust ning päädib läbi teaduslike uuringute ja parima praktika sünteesi avaliku sektori kinnisvara varajuhtimist kui uuritavat nähtust hõlmava kontseptuaalse raamistikuga. Teine ehk metoodilise osa peatükk loob neli avaliku sektori kinnisvara kvalitatiivselt kirjeldatud varajuhtimise mudelit ning metodoloogilise baasi nende kvantitatiivseks hindamiseks. Kolmas ehk empiiriline peatükk kirjeldab avaliku sektori kinnisvara varajuhtimismudelite analüüsimisel kasutatud

sisendeid ning hindab nende kaudu mudelite fiskaalmõju riigieelarvele ning valitsussektori tasakaaluarvestusele Eesti riigi keskvalituse hoonestatud kinnisvarakogumi näitel.

Teoreetiline raamistik

Oma multidistsiplinaaruse tõttu on kinnisvara varajuhtimisega seonduvat uurides väga raske keskenduda vaid ühele kindlale teoreetilisele seisukohale, kuivõrd seda ei ole käesolevaks hetkeks veel selgepiiriliselt väljakujunenud. Seetõttu töötatakse töö teoreetilises osas välja avaliku sektori varajuhtimise teoreetiline kontseptsioon ja raamistik, millest lähtutakse hilisema rakendusliku uuringu läbiviimisel, esitatuna doktoritöö empiirilises osas.

Töö teoreetilisest osast kantuna, tulenevad ka väitekirjas esitatud uurimisküsimus 1 ja väide 1, mis saavad sealsamas ka vastuse.

Uurimisküsimus 1: *Millised teooriad kujundavad avaliku sektori kinnisvara varajuhtimise uurimusliku baasi?*

Doktoritöö teoreetilises osas lähtuti eeldusest, et avaliku sektori kinnisvarajuhtimine kaasab samu distsipliine, mis erasektoripõhine ettevõtte kinnisvarajuhtiminegi, kuid nad erinevad teineteisest oluliselt käsitluse poolest. Sarnasus on selgelt märgatav juhtimisstrateegia ja keskkonna (peamiselt kinnisvararaturuga seotud) dimensioonidel, kus toimub kinnisvara juhtimine. Samas tuleneb peamine erinevus sisse avaliku sektori institutsionaalsel tasandil, kus on vajadus lähtuda laiemast perspektiivist saavutada eesmärke ühtaegu nii avalikke kui ka poliitilise huve järgides.

Väide 1: *Avaliku sektori kinnisvara varajuhtimise kontseptsioon järgib erasektoris rakendatavat ettevõtte kinnisvara varahaldamise kontseptuaalset raamistikku.*

Doktoritöö teoreetilises osas on esitatud senises kirjanduses esmakordselt rakendatud holistilist vaadet avaliku sektori kinnisvara varajuhtimise teoreetilise kontseptsiooni loomiseks. Ehkki väljapakutud kontseptuaalse raamistiku keskse kohal on ettevõtte kinnisvara varajuhtimine, mis on küll sarnase olemusega kontseptsioon erasektoris levinud lähenemisega, on avaliku sektori kontekstis kinnisvara varajuhtimine mõnede teoreetiliste lähtepunktide osas laiematähenduslik.

Kuivõrd avaliku sektori kinnisvara varajuhtimisega kaasub terve rida kompleksseid teemasid, on doktoritöö autor avastanud seoseid uuritava teemaga erinevatest distsipliinidest, nagu avaliku halduse, arvepidamise ning rahandusega seonduvast ning samuti ettevõtte rahandusvaldkonnast. Peamised teoreetilised lähtekohad, mis kujundavad avaliku sektori kinnisvara varahalduse kontseptuaalse raamistiku, on avaliku sektori rahandusteooria, organisatsiooniteooria, väärtuse hindamise teooria, optimeerimisteooria, stiimulite teooria (*incentives theory*), omandiõiguse teooria ning eelarveteooria, millest igaüks panustab omamoodi avaliku sektori kinnisvara varajuhtimise teoreetilisse raamistikku nii, nagu on esitatud doktoritöö sisulises osas joonisel 13.

Uurimismetoodika

Käeolev doktoritöö on avastuslik (*exploratory*) uurimus. Doktoritöös on rakendatud induktiivset lähenemist uuritavale probleemile, mille käigus autor on töötanud välja omapoolse teoreetilise raamistiku uuritava nähtuse selgitamiseks; vastandatuna deduktiivsele lähenemisele, mille käigus testitakse juba olemasolevat teooriat.

Doktoritöös rakendatud metodoloogia tuletamisel on võetud aluseks nii kuluarvestusest kui ka üldisest rahandusteooriast tulenevad põhiprintsiibid (muuhulgas näiteks raha ajaväärtuskontseptsiooni rakendamine). Selleks aga, et saada vastuseid dissertatsioonis püstitatud uurimisküsimustele ja väidetele, mis on seotud varajuhtimismudelitega, on kasutatud järgmisi uurimismeetodeid:

1) fiskaalmõjude analüüs (FIA), põhinedes
   - riigieelarvel (SB) ja valitsussektori tasakaaluarvestusel (GSA).
2) tulu-kulu analüüs (BCA), põhinedes
   - klasteranalüüsil (s.o riigi hoonestatud kinnisvara klassifitseerimine üld- ja eriotstarbeliseks kinnisvaraks);
   - *pro forma* fiskaalmõjul põhineva vaba rahavoo hindamisel, võttes arvesse vähemalt 30-aastast detailset prognoosiperioodi;
   - sobiva diskontomäära hindamisel.
3) stsenaariumianalüüs, põhinedes
   - kahesugusel nägemusel ehk stsenaariumil riigi hoonestatud kinnisvara klassifitseerimise osas üld- ja eriotstarbeliseks kinnisvaraks.

Seega, peamiseks töös kasutatud metoodikaks on antud uuringule sobivaks kohandatud tulu-kulu analüüs, mida on rakendatud, kasutades mudelipõhist lähenemist, kombineerituna stsenaariumianalüüsiga. Seniste arusaamade kohaselt peetakse tulu-kulu analüüsi avalikku sektorit puudutavates küsimustes kõige keerulisemalt rakendatavamaks (eeldab sisendite täpsust) analüüsimeetodiks, kuid samas kõige paremat ülevaadet andvamaks metoodikaks. Teisalt on kasutatud ka fiskaalmõju analüüsi, tuues välja erinevatest kinnisvara varajuhtimise mudelitest tulenevad mõjud (rahavood) nii riigieelarvele kui ka valitsussektorile. Kuivõrd analüüsiobjektiks on riigi keskvalitsuse hoonetekogum, siis mõningal määral (lähteandmetest tulenevate võimaluste piires) on rakendatud ka vara elukaarele omase kuluanalüüsi metoodikat (näiteks põhivara kulumi kaudu vajaminevate kapitalikulude tuletamisel).

Uurimuse läbiviimiseks vajalike andmete kogumisel on:

1) kasutatud on nii avalikult kättesaadavaid andmebaase, näiteks riigi kinnisvararegistrit, samuti muid statistilisi andmebaase ja makroökonoomilisi lähteandmeid, kui ka mitteavalikke andmebaase, nagu näitkes Riigi Kinnisvara ASi Archibus andmebaas, samuti Rahandusministeeriumi poolt edastatud inventuuriandmetele tuginevat ning hoonete pinnaandmeid sisaldavat andmekogu;
2) läbi viidud intervjuusid nii erinevate ministeeriumite riigiametnikega, kelle vastutusalas on riigi kinnisvaraga tegelemine kui ka muude erialaspetsialistidega;

3) võetud arvesse ekpertarvamusi seal, kus olemasolevate andmebaaside andmetest ei piisa või ei ole avalikkusele kättesaadavad.

Empiiriline uurimus

Doktoritöö empiiriline osa (ptk 3) rakendab teoreetilises osas (ptk 1) väljatöötatud avaliku sektori kinnisvara varajuhtimise teoreetilist kontseptsiooni töö metoodilises osas (ptk 2) väljatöötatud analüütilises raamistikus avaliku sektori kinnisvara varajuhtimismudelite fiskaalmõju hindamiseks.

Empiirilise uurimuse teostamiseks piiritleti ning võeti eelnevalt arvesse mitmeid eeldusi ning sõnastati vastused metoodilises osas tõstatatud uurimisküsimusele 2a ja sellega seotud väitele 2, väitele 3 ja väitele 4 ning samuti sõnastati vastus doktoritöö empiirilises osas tõstatunud uurimisküsimusele 2b.

Uurimisküsimus 2a: *Milline avaliku sektori kinnisvara haldamise ja omandamise vorm toob kaasa vähima negatiivse fiskaalmõju valitsussektori tasakaaluarvestusele?*

Doktoritöös läbiviidud kvantitatiivse fiskaalmõjude analüüsi tulemusena selgus, et eriotstarbeliste kinnisvarade puhul saavutas vähima negatiivse rahavoo valitsussektori tasakaaluarvestusele selline varajuhtimismudel, kus eeldati varade tsentraliseeritud omamist ja haldamist. Üldotstarbeliste kinnisvarade osas ei olnud võimalik ühest vastust anda, kuivõrd valitsussektori tasakaaluarvestuse fiskaalmõju väljatoomine tsentraliseeritud mudelis eeldas selgepiirilist teadmist tururendi komponentide suurusest, mille osas uuringu läbiviimise hetkel täpne selgus aga puudus.

Kokkuvõttes on uurimisküsimusele 2a vastamiseks võimalik lähtuda kahesugusest perspektiivist, võttes aluseks kas lühiajalise või pikaajalise ajahorisondi. Lühiajalises perspektiivis annavad kulupõhised varajuhtimismudelid selgelt nõrgema tulemuse ehk toovad kaasa suurema negatiivse fiskaalmõju, kui turupõhised varajuhtimismudelid. Pikaajalises perspektiivis, kõigi eelduste kohaselt, omavad kulupõhised mudelid siiski eelist turupõhiste mudelite ees. Kõige fundamentaalsemal tasemel, vaadelduna väga pikaajalises perspektiivis, ei ole aga vahet, millist kinnisvara varajuhtimismudelit eelistada, kuivõrd nad kõik on üksteisega võrreldavad – nii kulu- kui ka turupõhised mudelid – ning peaksid saavutama kokkuvõttes ühesuguse tulemuse. Teisisõnu öeldes – juhul, kui eksisteerib pikaajaline võrdsus ühikulisel tasemel kasutuskulu, üürihinna ja kinnisvara turuhinna vahel, siis võib eeldada, et pikaajalises plaanis on avaliku sektori varajuhtimise mudelid fiskaalmõjude poolest võrdsed.

Väide 2: *Riigi tsentraliseeritud avaliku sektori kinnisvara omamisvorm kombineerituna riigi poolt vahendatud tsentraliseeritud varahaldamisvormiga toob kaasa vähima negatiivse fiskaalmõju valitsussektori tasakaaluarvestusele.*

Uuringu tulemusena selgus, et juhul, kui riik omab kogu kinnisvarakogumit, kuid selle haldamine on antud tsentraliseeritud vormis üle riigi omanduses

olevale ettevõttele, siis see tähendab, et seesuguse varajuhtimismudeli rahavoo tingivad vaid kulud (tulusid seesuguse varajuhtimise vormi juures ei genereerita) ning mudeli eelis teiste alternatiivsete mudelite ees saavutatakse läbi eeldatava varajuhtimiskulude mastaabisaaästu. Seega – mida suurem on läbi tsentraliseeritud haldamise saavutatav varajuhtimiskulude tegelik mastaabisääst, seda väiksem on ka negatiivne fiskaalmõju riigieelarvele ja valitsussektori tasakaaluarvestusele.

Doktoritöös esitatud empiiriline analüüs näitas, et juhul, kui eeldada eriotstarbeliste varadekogumiga seoses 10%list varajuhtimiskulude mastaabisäästu ilma pinna optimeerimiseta, siis riigi tsentraliseeritud avaliku sektori kinnisvara omamisvorm kombineerituna riigi poolt vahendatud tsentraliseeritud varahaldamisvormiga annab parema tulemuse, kui täielikult riigi poolt teostatud nii tsentraliseeritud omamise kui ka haldamisega varajuhtimismudel. Siiski, tulenevalt täiendavate eelduste puudumisest, peamiselt pinnaoptimeerimise osas, toob kaasa tsentraliseeritud omamise ja riigi poolt vahendatud tsentraliseeritud haldamisega varajuhtimismudel suurema fiskaalmõju, võrreldes riigi poolt vahendatud tsentraliseeritud avaliku sektori kinnisvara omamis- ja haldamisega varajuhtimismudeli ning avaliku sektori varade privatiseerimismudeliga.

Väide 3: *Riigi poolt vahendatud tsentraliseeritud avaliku sektori kinnisvara omamis- ja haldamisvorm toob kaasa vähima negatiivse fiskaalmõju valitsussektori tasakaaluarvestusele.*

Doktoritöös läbiviidud mudelipõhine fiskaalmõjude analüüs tõi välja, et riigi poolt vahendatud tsentraliseeritud avaliku sektori kinnisvara omamis- ja haldamisvorm toob kaasa vähima negatiivse fiskaalmõju valitsussektori tasakaaluarvestusele ainult eriotstarbeliste hoonete kogumi arvestuses, mis saavutati varahalduskulude mastaabisäästu ja hoonete pinnaoptimeerimise eeldusele tuginedes. Tulenevalt tururendi komponentide probleemile, mida kirjeldati alaptk-s 3.5., ei olnud võimalik võrrelda omavahel turu- ja kulupõhiseid mudeleid (riigivahendusega tsentraliseerimise mudelit varade privatiseerimise mudeliga), et anda selgesõnalist ja ühest vastust mudelite paremuse osas.

Väide 4: *Avaliku sektori kinnisvara müümne erasektorile ning vajamineva pinna tagasirentimine erasektorilt toob kaasa vähima negatiivse fiskaalmõju valitsussektori tasakaaluarvestusele.*

Tulenevalt potentsiaalsetest sõjalis-poliitilistest riskidest ning ka tsiviiltasemel turvakaalutlustest, võimaldab reaalset müügi- ja tagasirenditehingu teostamist vaid riigi keskvalitsuse üldotstarbeline hoonetekogum. Selles tulenevalt võib väita, et mida suurem on üldotstarbeliste varade müügist saadav tulu ning mida madalam on samade varade optimeeritud pinna tagasirentimisel erasektorile makstav pikaajaline lepinguline tururent, seda parema tulemuse saavutab varajuhtimismudel, kus rakendatakse avaliku sektori kinnisvara müümise ja vajamineva pinna tagasirentimise kontseptsiooni erasektorilt (st seda vähima negatiivse fiskaalmõju toob endaga kaasa müügi- ja tagasirentimise mudel GSAle), võrreldes kõikide teiste analüüsitud varajuhtimismudelitega. Teisalt on praktika

näidanud, et keskvalitsusel on kalduvus müüa oma omanduses olevat kinnisvara diskontoga ehk alla selle keskmise turuväärtuse (võrreldes institutsionaalse ja mitteinstitutsionaalse erasektoriga; vt Wiley 2012), mis võib varade privatiseerimise mudeli eeliseid kahandada teiste varajuhtimise mudelite ees.

Uurimisküsimus 2b: *Kas ja milliste tingimuste juures peaksid neli väljatöötatud avaliku sektori kinnisvara varajuhtimismudelit olema võrreldavad selleks, et oleks võimalik vastata uurimisküsimusele 2a?*

Doktoritöö empiirilises osas sõnastati mitmeid eeldusi ja klausleid, millele tuginedes konstrueeriti avaliku sektori kinnisvara varajuhtimismudelid ning viidi läbi nende analüüs. Toodud eelduste hulgas olid aga mitmed eeldused sellised, mis on äärmiselt olulised analüüsitud nelja varajuhtimismudeli omavahelise võrreldavuse tagamiseks selleks, et läbiviidud mudelipõhise uuringu põhjal saaks teha üldistavaid järeldusi. Esiteks on mudelite võrreldavuse tagamiseks oluline eeldada, et mudelite baasandmetena kasutatud hoonete pinnaandmed oleksid võrreldavad ning seda nad tegelikkuses ka olid. Teiseks fundamentaalselt oluliseks eelduseks oli mudelite üleselt sarnase investeerimis- ja finantseerimismahu tagamine, sh sarnase finantseerimisstruktuuri (oma- ja võõrkapitali osatähtsuse) olemasolu. Kolmandaks oluliseks eelduseks oli, et eriotstarbeliste ega üldotstarbeliste varade kasutusotstarve ei muutu kogu analüüsitava perioodi (30 aastat ja sealt edasi) jooksul.

Põhitulemused ja järeldused

Doktoritöö käigus selgus, et avaliku sektori kinnisvara varajuhtimismudelite fiskaalmõju hindamiseks on oluline läbi viia kvantitatiivne analüüs. Selleks konstrueeriti esmalt kvalitatiivsel tasemel neli mudelipõhist stsenaariumi, mis kirjeldaksid tüüpilisemaid avaliku sektori praktikas ettetulevaid kinnisvara juhtimisega seotud kombinatsioone omamise, haldamise ja finantseerimise raamistikus. Keskseimaks uurimisküsimuseks (RQ.2b) mudelite fiskaalmõju analüüsi läbiviimisel tõstatus mudelite omavaheline võrreldavus. Kuigi uurimus teostati läbi mitmete kitsenduste, oli võimalikult adekvaatsete tulemuste saamise põhitingimusena oluline eeldada, et varajuhtimismudelid on üksteisega võrreldavad nii analüüsitava riigi keskvalitsuse hoonekogumi pinnasuuruse ning investeerimismahu kui ka finantseerimisvormi poolest. Teoreetiline varajuhtimismudelite võrreldavuse eelduse kehtivus andis tuge varajuhtimismudelite praktilise kvantitatiivse analüüsi läbiviimiseks, mille eesmärgiks oli välja selgitada selline avaliku sektori kinnisvara varajuhtimise vorm, millega kaasneb vähim negatiivne fiskaalmõju riigieelarvele ja valitsussektori tasakaaluarvestusele (RQ.2a).

Rahavoogudel põhineva nelja-tasandilise kvantitatiivse fiskaalmõjude analüüsi tulemusena selgus, et kõikide hinnatud avaliku sektori kinnisvara varajuhtimismudelite fiskaalmõju nii riigieelarvele kui ka valitsussektori tasakaaluarvestusele on kogu vaadeldud 30-aastase prognoosiperioodi jooksul negatiivne. Vähima negatiivse fiskaalmõju selgitamiseks tuli hinnata riigile suunatud valitsussektori tasandil rahavoo diskonteerimismäära võimalikku suurust 30-aastases

perspektiivis. Teostatud analüüsi kohaselt leiti, et sobiliku diskontomäära suuruseks on kõikide varajuhtimismudelite üleselt 5,15% (s.o riigi laenukapitali kulukuse määr). Võttes aluseks varajuhtimismudelite diskonteeritud rahavoolisi fiskaalmõju tulemusi, osutus eriotstarbeliste varade osas vähimat negatiivset rahavoogu genereerivaks varajuhtimismudeliks riigi poolt vahendatud tsentraliseeritud avaliku sektori kinnisvara omamis- ja haldamisvorm. Saadud tulemus võimaldab antud doktoritöö raames väita, et eriotstarbelised varad on otstarbekas üle anda RKASi omandusse ja haldusesse.

Lisaks näitas läbiviidud fiskaalmõjude analüüs ühe olulise tulemusena, et kuivõrd varajuhtimismudelites empiiriliste lähteandmetena kasutatud tururendid ja nende kasvumäärad ei ole piisavalt usaldusväärsed, siis turu- ja kulupõhised varajuhtimissmudelid ei ole omavahel võrreldavad, samuti ei ole võrreldavad omavahel ka kaks turupõhise eeldusega analüüsitud üldotstarbelise kinnisvarakogumiga varajuhtimismudelit (mudelites 3 ja 4). Eeltoodust tulenevalt järeldub, et käesoleval hetkel avaliku sektori kinnisvara varajuhtimismudelites kvantitatiivsete sisenditena kasutada olevate algandmete juures ei ole ühese hinnangu andmine parima varajuhtimismudeli osas võimalik.

Üldotstarbeliste varade kogumiga seotud varajuhtimismudelite analüüsi tulemuse põhjal võib öelda, et:

(a) kulupõhised ja turupõhised varajuhtimismudelid ei ole praeguste sisendite kvaliteedi juures võrreldavad;
(b) kulupõhistest varajuhtimismudelitest (mudelid 1 ja 2) osutus parimaks mudel 2 (st genereeris vähima väljamineku riigile suunatud valitsussektori tasakaaluarvestuse tasandil väljatoodud rahavoost);
(c) turupõhiste varajuhtimismudelite (mudel 3 ja 4) puhul ei ole olemasolevate andmete juures võimalik paremuse osas vastust anda, kuna:
    i. tururendis sisalduvad komponendid (nt omanikutulu-, korrashoiukulude, perioodiliste remondikulude, kapitaliinvesteeringute komponent vms) on teadmata arvsuurused, nende objektiivseks kajastamiseks ei olnud uuringu teostamise hetkel (s.o 2011. aasta algus) Eesti tingimustes piisavalt avalikult kättesaadavat informatsiooni;
    ii. tururendi hetkehinnang, mis peegeldas hinnangu andmise hetkel kehtivat pinnanõudmise ja -pakkumise vahekorda kinnisvaraturul, ei pruugi olla adekvaatne alus koostamaks tururendi täpset prognoosi järgnevaks 30 aastaks, mistõttu ei ole seda reaalselt töös ka rakendatud;
    iii. iga-aastaselt valitsussektorisse jääva rahavoo osatähtsuse väljatoomise lähendina (*proxy*) kasutatud valitsussektori rahavoomäära suurus sõltub otseselt tururendis sisalduvate komponentide suurusest;
    iv. tulenevalt punktidest i ja iii, tekib mudelites tundmatute suurustega iteratsiooniprobleem, mis mõjutab kokkuvõttes iga-aastaste valitsussektorist väljuvate rahavoogude suurust.

Üldotstarbeliste varade võimaliku müügi mõju analüüs riigieelarvele näitas, et võttes arvesse esialgset riigile mittevajalikku pinna mahtu ning RKASi varadekogumit ja valitsejate kirjeldusele vastavat varakogumi jaotust, moodustaks po-

tentsiaalne üldotstarbeliste varade müügimaht 2011. aasta jaanuari seisuga kokku 411 298 m^2 kasuliku pinna arvestuses ning summaarne potentsiaalne netomüügitulu (diskonteerimata) kavandatava 5-aastase müügiperioodi jooksul kokku oleks 125,9 mln eurot (keskmiselt *ca* 25,18 mln eurot aastas). Võttes arvesse esialgset riigile mittevajalikku pinna mahtu ning RKASi varadekogumit ja Rahandusministeeriumi kirjeldusele vastavat varakogumi jaotust, moodustaks potentsiaalne üldotstarbeliste varade müügimaht 2011. aasta jaanuari seisuga kokku 812 213 m^2 kasuliku pinna arvestuses ning summaarne potentsiaalne netomüügitulu (diskonteerimata) kavandatava 5-aastase müügiperioodi jooksul kokku oleks 243,5 mln eurot (keskmiselt *ca* 48,7 mln eurot aastas). Sellest tulenevalt võib väita, et parimaks osutub Rahandusministeeriumi kirjeldusele vastava varakogumi jaotusega stsenaarium.

- **Järeldused ja soovitused seoses avaliku sektori kinnisvara varahalduse juhtimisega**

Avaliku sektori administreerimise eesmärgist lähtuvalt tuleks valida seesugune kinnisvara varajuhtimise mudel, mis rahuldab avaliku sektori pinnakasutuse vajadusi kõige säästlikumal moel. Kuivõrd avaliku sektoriga seotud tegevusi vaadeldakse pikaajalises perspektiivis, siis tuleks ka kinnisvara varajuhtimisega seotud otsuste juures lähtuda mitte lühiajalisest, vaid põlvkonnaülesest perspektiivist. Siinjuures on väitekirjas pakutud välja metoodika, kuidas rakendada etapiviisilist otsustusprotsessi avaliku sektori kinnisvara varajuhtimise hindamiseks praktikas. Hindamiskäigu tuumaks on mudelipõhine lähenemine, mis koosneb neljast tegevusstaadiumist selleks, et jõuda lõpptulemusena avaliku sektori kinnisvarakogumi fiskaalmõjuanalüüsi tulemini (vt joonist 35) .

- **Järeldused ja soovitused seoses avaliku sektori kinnisvarapoliitiliste otsustega**

Selleks, et tagada riigiametnike tegevuses läbipaistvus, on oluline jälgida, et riigi kinnisvaraga tehtavad otsused oleksid kooskõlas valitsuse poolt vastuvõetud riigi kinnisvarapoliitika ja -strateegiaga. Samas tuleb olla oma otsustes ettevaatlik, et lühiajalise riigieelarve täitmise tulemusena ei saaks kahjustatud tulevaste põlvkondade rikkus (näiteks seoses riigiomandis oleva vara müümisega). Eriti ettevaatlikult tuleks suhtuda üleminekusse kulupõhistelt riigi kinnisvara varajuhtimise mudelitelt turupõhistele mudelitele, kus mudeli sisendteguritest tulenev määramatus kordades suureneb. Üleminekul detsentraliseeritud varajuhtimise mudelilt riigi poolt vahendatud tsentraliseeritud avaliku sektori kinnisvara omamis- ja haldamisvormile, on oluline võtta arvesse meetmeid (kas seadusandlikul moel või muul viisil), mis hoiaksid ära võimaluse toimida selle ülesande täitmiseks loodud riigiomandis oleval kinnisvaraettevõttel mittesäästlikul moel.

Piirangud ja soovitused edasisteks uurimusteks

Doktoritöö hõlmab endas nii teoreetilist kui ka metoodilist laadi piiranguid. Teoreetiliste piirangutena võib välja tuua ühtse olemasoleva ning juba väljatöötatud teoreetilise baasi puudumise uuritava probleemi – avaliku sektori kinnisvara varahalduse – käsitlemiseks. Sestap tuli autoril esmalt välja töötada omapoolne teoreetiline raamistik uurimuse läbiviimiseks. Samas, teoreetilise raamistiku loomise ning hilisema uurimuse läbiviimise muutis omakorda komplitseerituks uuritava teema laiaulatuslik interdistsiplinaarsus ning avaliku sektori kinnisvara varahaldust puudutava akadeemilise kirjanduse vähesus. Kirjandusest tulenev piirang tingis teiseste andmeallikate kasutamise, sh erinevates riikides väljatöötatud kinnisvaraalaste standardite kui ka era- ja avaliku sektori parimat praktikat kirjeldavate raportite kasutamine.

Doktoritöö metoodilise poole pealt võib esile tuua varajuhtimismudelitest tulenevad piirangud, kuivõrd käesoleva töö ajaline ressursipiirang ei võimaldanud kaasata analüüsi rohkema arvuga alternatiivseid avaliku sektori kinnisvaraga seotud varajuhtimismudeleid. Näiteks jäid käsitlemata praktikas rakendatud era- ja avaliku sektori koostoimemudel (PPP), samuti võimaliku alternatiivse lahendina riigi kinnisvarakogumi põhjal eraldiseisva fondi moodustamine (*special purpose vehicle – SPV*), mis võimaldaks samas ka sel moel konsolideeritud kinnisvarakogumi tagatisel väärtpaberite emiteerimist. Enamikke töös mittekajastamist leidnud alternatiivseid varajuhtimismudeleid on võimalik seostada võimalike alternatiivsete lahenduste pakkumisega eelkõige just üldotstarbeliste varade juhtimiseks.

Töö edasiarendamise võimalustena võib välja tuua alljärgnevat:

- kasutada närvivõrkude meetodit varahaldusmudelite sisendite modelleerimiseks, kuivõrd võib eeldada, et tulude ja kulude andmerida pikaajalise prognoosiperioodi jooksul ei järgi lineaarset kasvujoont;
- võtta arvesse ja täiendada mudelite fiskaalmõju analüüsi erinevate avaliku sektori kinnisvara finantseerimisvõimaluste kaasamisest tulenevat efekti;
- fisklaamõjude hindamise alternatiivina kaaluda portfelliteooria ja reaalse optsiooni väärtuse teooria põhimõtete rakendamist avaliku sektori kinnisvara varajuhtimismudelite hindamisel;
- turu- ja kulupõhiste varajuhtimismudelite omavahelise parema võrreldavuse tagamiseks töötada välja ökonomeetriline mudel riigi kinnisvara omamisega seotud ühikulise kapitalikulu (*unit cost of capital*) ning tururendi vahelise tasakaalutulemuse hindamiseks.

Kõige eeltoodu kokkuvõttena lõpetab autor mõttega, et avaliku sektori kinnisvara varajuhtimise uurimisse tuleks lülitada muuhulgas ka sotsiaalse vastutuse teema, mille tulemusena võiks kujuneda senisega võrreldes täiesti uus diskursus antud valdkonnas.

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Lecturing (main subjects)**:** MJJV.10.005 Financial Management
MJJV.10.055 Financial Management (in English)
MJJV.10.054 Real Estate Finance
MJJV.10.002 Corporate Finance
MJJV.10.063 Personal Finance
MJ00.00.012 Individual Project (Methodology of Economics)

Main research areas: Real estate valuation, real estate finance and investments, entrepreneurial financial analysis, public sector real estate finance, behavioural finance

Social work, membership: 1999–to date – the member of the exam commission of real estate appraiser's certification in Estonia, coordinated by the Estonian Association of Appraisers (EKHÜ)

2004–to date – the member of the working group of valuers' auditing, coordinated by the Estonian Association of Appraisers (EKHÜ)

2008–to date – the honorary member of NPO KinnisvaraMagnaadid (Real Estate Tycoons)

Practical projects: 2010–2011 – responsible researcher in procurement project "Financing models for state buildings", Ministy of Finance, Eston

Academic work: Researching
Teaching
Editing and reviewing

ELULOOKIRJELDUS

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	2001–2006 – doktoriõpe, Tartu Ülikool, Majandusteaduskond
	1999–2000 – maristriõpe, Stockholms Universitet, MSc (major in Business Administration)
	1990–1994 – bakalaureuseõpe, Tartu Ülikool, Majandusteaduskond, raha ja panganduse eriala
	1990 – keskharidus, Miina Härma nim Tartu 2. Keskkool (praegune Miina Härma Gümnaasium)
Keelteoskus:	eesti keel (emakeel), inglise keel (väga hea), vene keel (hea), saksa keel (algtase), prantsuse keel (baastase), soome keel (baastase)
Teenistuskäik:	2014... – Tartu Ülikool, Majandusteaduskond, Ettevõttemajanduse instituut, Rahanduse ja majandusarvestuse õppetool, rahanduse nooremteadur (0.5)
	2010–2014 – Tartu Ülikool, Majandusteaduskond, Ettevõttemajanduse instituut, rahanduse lektor
	2006–2010 – Tartu Ülikool, Majandusteaduskond, Ettevõttemajanduse instituut, ärirahanduse ja investeeringute lektor
	2005–2006 – Tartu Ülikool, Majandusteaduskond, Ettevõttemajanduse instituut, erakorraline teadur (0.1)
	1997–1999 – Astri & PK AS, finantsanalüütik
	1994–2005 – Tartu Ülikool, Majandusteaduskond, ärirahanduse ja investeeringute assistent

Administratiivne töö: 1999–2005 – ERASMUS-programmi üks koordinaatoritest TÜ majandusteaduskonnas

Täiendkoolitus, uurimistöö välismaal:

2008 – ArcGIS treeningõpe: AlphaGIS OÜ, Tallinn

2006 – doktoritööga seotud konsultatsioon, Kuninglik Tehnikakõrgkool (KTH), Stockholm, Rootsi

Õppetöö: MJJV.10.005 Finantsjuhtimine
MJJV.10.055 Finantsjuhtimine (inglise keeles)
MJJV.10.063 Eraisiku rahandus
MJJV.10.002 Rahandus
MJJV.10.054 Kinnisvara rahandus
MJ00.00.012 Uurimus (Majandusteadus)

Uurimisvaldkonnad: Kinnisvara väärtuse hindamine, kinnisvara finantseerimine ja investeeringud, ettevõtte finantsanalüüs, avaliku sektori kinnisvararahandus, käitumuslik rahandus

Ühiskondlik tegevus: 1999–... – EKHÜ poolt koordineeritava hindajate atesteerimise eksamikomisjoni liige

2004–…– EKHÜ poolt koordineeritava hindajate auditeerimise töögrupi liige

2008–... – MTÜ KinnisvaraMagnaadid auliige

Rakendusuuringud: Riigihanke nr 119486 “Riigi hoonestatud kinnisvara rahastamismudelid” vastutav täitja (tellija: Rahandusministeerium, TOF, 21.09.2010–28.04. 2011)

Akadeemiline töö: Teadusuuringute läbiviimine
Õppetöö läbiviimine
Uurimuste juhendamine ja retsenseerimine

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