

## Dynamic Model of Strategic Plan (Based on Saint Petersburg's Infrastructure Analysis)

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**Abstract:** Strategic plan allows exercising the balance between Saint Petersburg regional market regulating and rigorous system of centralized planning. The proposed approach of strategic plans elaboration is based on detailed scrutinizing of power and engineering infrastructure issues-a single measure which could enable further metropolis development. Analysis of Saint Petersburg infrastructure temporal development (dynamics) turns to become the basis for approval of projects pertaining to city areas housing development patterns and socio-economic development. Methodology used allows elaborating effective activity packages together with actually targeted programs of city power and infrastructure facilities construction.

**Key words:** Infrastructure • Iteration • Dynamic scenario

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### INTRODUCTION

Market being an instrument of manufacturers strategies directed towards end users' preferences had been considered by numerous researchers as a necessary activity for centralized economics managing. The possibility of market integration into centralized economics had been recognized by A. Lerner (The Economics of Control: Principles of welfare economics, 1944), A. Pigou (Employment and Equilibrium, 1949), H. Dickinson (Economics of socialism, 1971), R. Hall (Introduction to economics, 2000). They stick to the opinion that effectiveness of resources employment in centralized economics would be considerably higher if its mechanism is configured on free competition basis with provision of market impact on national economy plans proportioning [1].

J. Galbraith, W. Rostow and P. Sorokin made attempts to determine the model of "civilized synthesis", i.e. government regulation of economics in which planning mechanisms and indirect supervision would be accompanied by unregulated market as a principal

regulator of economic proportions. So, for example, Galbraith held the view that "consumer society" is dispatching too little resources for public needs and infrastructure. [2-3]. As an alternative, he forwarded strategic planning as a governor of state expenditures capable to exercise power over the market forces. In fact, it is easy to neglect the difference between "private" and "public" sectors of economics under the conditions of dynamic strategic regulation. The key point is that corporations which are governed by technostructure represent planning subsystem while minor companies-the market subsystem of national economics. At this, the planning subsystem is exploiting the free market system and thus creates inequality of income distribution. After all, since technostructure, being varied in form, is occupying leading places in the world, the process of economy management results in evolutionary convergence of free competition and planning systems. In the "age of uncertainty" which is characterized by all-round strategic planning and deployment of economic security projects we are facing a new global phenomenon-self-exploitation [5, 6].

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Challenging Keynes' approach to economics defined as "appropriate model selection skill" [7], J. Tinbergen assumed appearing of "mixed economics" which would allow to reach public optimum in condition of economic planning and private property [8-9].

Introducing the "functional sovereignty" concept (other than national), he employed it for theoretical analysis of structures which could originate as a result of close cooperation between states which sustain jurisdiction over their own economic area though admit existence of specific international bodies like European Community. Within global strategic management it enabled creation of economic relations regulating system with assistance of international political and economic bodies. Furthermore, Tinbergen forwarded the concept of "humanity common heritage" according to which natural resources must belong to entire Earth population. At this, any owners' "losses" could be compensated through equivalent exchange for economic resources. In this connection he laid down the concept of overriding the "dissolution" between "rich North" and "poor South" [10-11].

Thus, today's recessive development of world society prearranged the new type of social structure integrated with a cybernatically organized global economics management system aimed at human life quality improvement. Dynamic model of strategic planning is considered to be the new system nucleus [12-14].

Within the context of aforesaid, wide-scale activities aimed at modern state planning system creation were initiated in St. Petersburg in the year 2004. New outline of state planning was shaped on the basis of St. Petersburg Strategic development Plan adopted in 1997 and with reference to other crucial documents regarding city development [16]. One of the most important steps was organization of professional discussion dedicated to St. Petersburg policy in the basic spheres of city life activities [16].

In 2013 this discussion involved more than 700 participants representing almost all spheres of city economic and social spheres. All substantiated and actualized materials containing detailed proposals were taken into consideration by the planners in their activities dedicated to working materials improvement [17].

Human function which constitutes the basis of innovative economics has significantly changed. Logic of proposals comprising the new Strategy (2014) is based on power producing and utility infrastructure steadiness. It is necessary to underline the following. According to American economist D.H. Ciscel the concept of planning

system could replace the market theory [20]. In mature corporations and in planning system as a whole all powers and management shifted from owners towards technostructure which consists of engineering-and-technical personnel representatives who do not belong to proprietary class. Technostructure, according to Ciscel, is a "social class whose position in economics is determined by its participating in strategic decisions taking process; this class is controlling the property though not owing it" [20, p. 412]. In view of this, unreasonable inflated role of technostructure i.e. those who are in possession of special knowledge and team decision taking skills, namely lead managers who are in a position to take principal management decisions, is one of the factors which considerably impede Saint Petersburg steady growth and reduce to nothing the advantages of dynamic model of city development strategic Plan [21].

## MATERIALS AND METHODS

Methodological concept of this paper is based on researches carried out by foreign and national economists investigating the problems of metropolises strategic planning and researches of Saint Petersburg State University of Architecture and Civil Engineering named: "Methodological problems of investment structural policy efficiency in nonproductive sphere" [22], "Methodological problems of regional investment structural complex being a self-organized and self-regulated system" [23]. Systemic, situational and expert analysis constituted the research basis [24].

BCG, GE/McKinsey models, ADL matrix etc. were used to support formulation process. Analysis of multiple scenarios and strategic alternatives of power producing and utility infrastructure development was performed with the use of following instruments:

- Cognitive maps method to reveal the structure of causal links between nodal points of the problem, decision trees;
- Expert estimations for knowledge information processing facilitating the task solution;
- Situational approach and methodological scenarios to offer various activities options.

**The Main Part:** Audit of city power producing and utility infrastructure functioning and condition

In order to organize effective process of strategic planning especially when compiling the plan of long-range dwelling and municipal buildings construction

Table 1: Dynamics of Saint Petersburg's power producing and engineering facilities performance

Index	2011	2012	2013	2014	2015
Thermal capacity increment, Gcal/hr.	562.1	572.6	588.2	615.6	642.7
Installed capacity increment (water heating boiler plants) with account to withdrawn equipment, Gcal/hr.	31.5	526.7	332.0	152.4	122.9
Installed capacity increment (thermal power plants) with account to withdrawn equipment, Gcal/hr.	-256.0	184.0	880.0	0.0	672.0
Water consumption increment, thousand m <sup>3</sup> /day.	34.7	35.7	37.3	38.8	39.6
Alteration of reduced capacity of water supply head works (+ input;-output), thousand m <sup>3</sup> /day.	0.0	21.0	0.0	-18.0	-41.0
Increment of waste water disposal, thousand m <sup>3</sup> /day.	34.8	35.6	37.4	38.9	39.7
Increment of reduced capacity of waste water treatment plants (+ input;-output), thousand m <sup>3</sup> /day.	0.0	202.5	0.0	52.4	239.0
Urban wastes, thousand m <sup>3</sup> /year.	10848	11312	11774	12236	12700
Wastes recycling, thousand m <sup>3</sup> (thousand t)/year.	-	-	2300 (440)	2200 (420)	4300 (830)

it is required to carry out dynamic analysis of city power producing demand and engineering equipment condition. Dynamics of power producing and engineering facilities performance is shown in Table 1.

Basic features of Saint Petersburg power producing and engineering infrastructure are [25]:

- Condition of Saint Petersburg water supply system satisfies demands of entire consumers. Redundancy of water production plants reaches 92 thousand m<sup>3</sup>/day.
- Construction of new and reconstruction of existing local thermal power production facilities in districts where centralized thermal power supply is inexpedient;
- Construction of new Thermal Power Plants (TEC) applying combined cycle power units in city districts which have electric power deficit;
- Connection between 110 kV line and outer network was attenuated due to 330 kV network line circuit design;
- Electric network of Saint Petersburg is divided into six territorial-production clusters. North-Western, Central, Eastern and South-Western parts ensure the required reliability indexes due to cross-feeding;
- Large-scale energy saving activities in Saint Petersburg dwelling, municipal sphere and industrial.

All that demonstrates problems of city power producing and engineering infrastructure. The question is: "Where does unsteadiness come from?"

Factor of increasing unsteadiness of city economic system consists in mature corporation. Planning performed by large corporations in condition of missing government regulation is usually unsteady and sometimes

even inferior. It is subjected to slumps and business depressions which may become cumulative. Companies are being affected by inflation which has persistent character and cannot be self-regulated. In view of this, the target is to reduce the power of corporations and technostructure and thus decrease pressure of military concerns and Defense Ministry authorities "bureaucratic symbiosis". Only state independent of corporations may reduce negative tendencies affect and facilitate further system strategic development [26].

Elaboration of power producing and engineering infrastructure strategic development Plan.

It is expedient to rely on fiscal rather than on monetary policy and combine it with tax increase, reduction of Federal deficit and considerable lowering of interest rate. Only this approach allows to strategically developing city infrastructure through implementation of targeted programs and projects [27].

Process of power producing and engineering infrastructure development is based on consideration of external (competition, market, technologies etc.) and internal changes (organizational, competence-based etc.) and includes three stages: elaboration, implementation and evaluation of strategic planning results (Fig. 1).

Stage of strategic plans elaboration includes four steps: preparation, analysis, working out and approval (Fig. 2):

To minimize risks it was proposed to apply infrastructural approach as a basis for city social-economic growth and identify principal infrastructures like utilities, transport and power producing facilities. Results obtained made it possible to elaborate hypothetical scenarios (options) of city development in future and to perform SWOT-analysis (analysis of Strengths, Weaknesses, Opportunities and Threats).

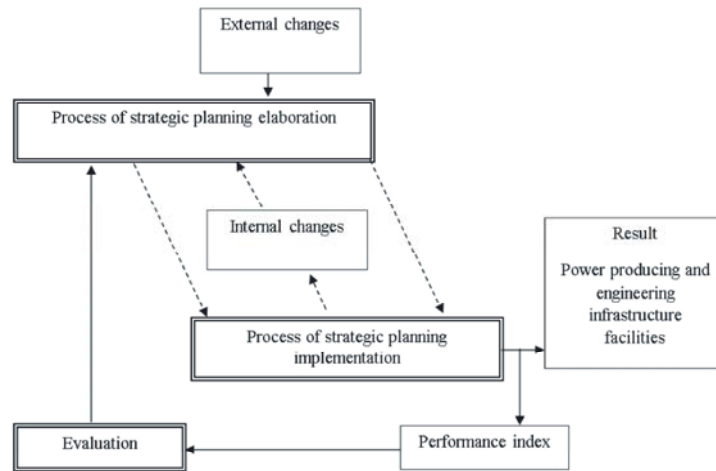


Fig 1: System of power producing and engineering infrastructure strategic planning

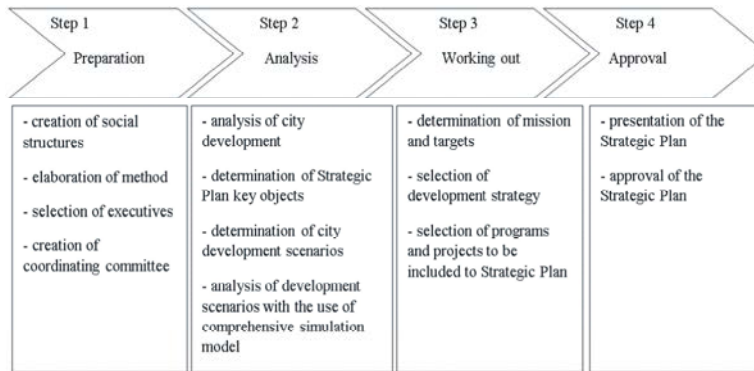


Fig 2: Strategic Plan elaboration steps

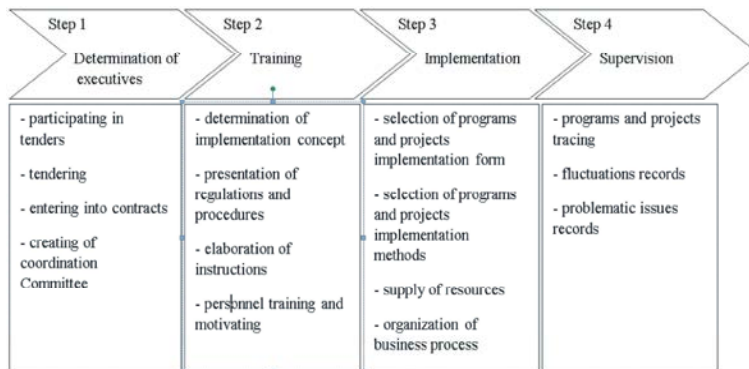


Fig 3: Steps of St. Petersburg Strategic Development Plan implementation

All development scenarios are being tested with complex simulation model aiming at achieving of minimum market dependence.

In order to forward unprejudiced solution and achieve technostructure self-preservation we involved a wide range of experts whose task is to give professional evaluation of materials prepared by the planning group. Strategic Plan should be approved upon completion of

public discussion and rectifying of deficiencies. This step should symbolize widening and strengthening of bureaucracy and technostructure powers.

Basic steps of Strategic Plan implementation are shown in Fig. 3.

Results are represented by comprehensive power producing and infrastructural facilities and indexes of scenarios implementation [13].

**Helpful Experience of Strategic Plan Updating and Correcting:**

Demand in planning is explained by production technology complication, considerable growth of capital investments and severization of requirements in the sphere of production. Saint Petersburg Strategic development Plan dated December 1, 1997 reflects technology complication. It was first document of this kind in Russian Federation. It was aimed at shaping Saint Petersburg as multifunctional metropolis integrated in Russian and global economics and providing high living and production standards. Here we perceive state economic activities to be essential factor finalizing the planning process [28].

However, in the latter case we contend with dialectics. In our opinion, government intervention into strategic planning and security should not serve as a means of corporation power accretion (for instance GAZPROM). On one hand, we have a market system incorporating small business, agriculture, education health protection, transport and other social service spheres which cannot omit state support and sequential regulation. On the other hand, large scale corporations require strategic planning and, therefore, aim at enslaving the state. This evident contradiction should be resolved in a way that state puts aside supervision over the planning system and shifts the entire efforts to market regulation.

Basic task of Saint Petersburg government should consist in implementation of measures which would facilitate market system development and decrease of state exploitation by state corporations. In this respect the Strategic Plan envisages the following:

- Assurance of continuous, reliable and safe operation of the city power producing complex;
- Reconstruction and modernization of city power systems;
- Development of autonomous heat supply clusters;
- Development of electric distribution networks;
- Improvement of gas distribution networks;
- Improvement of city illumination system;
- Assurance of continuous water supply for the entire consumers;
- Improvement of drinking water quality (modernization of city water treatment plants);
- Decreasing of specific electricity and water consumption;
- Improvement of sewage treatment system;
- Buildup of regional power energy market independent of state corporations dictate;

- Enhancement of supervision over natural monopolists activities (price regulation, fixing of minimum guaranteed incomes, supporting of trade unions, rising of salaries, exercising of beneficiary policy providing capital investments and advanced engineering facilities for the market system etc.) [29].

Nevertheless, detailed information regarding implementation of each of 211 items included in Strategic Plan demonstrates that considerable part (25%) of the plan failed to be fulfilled [30].

If to take into consideration the results of dynamic modeling of city power producing and engineering infrastructure it is necessary to state that steady provision of citizens with social and economic spheres, power energy and utility services demands:

- Implementing of steady and balanced politics in power producing and utility spheres on the basis of government institutions;
- Exercising of large-scale power saving activities.

In these conditions, in order to provide successful development of power producing and engineering infrastructure it is required to fulfill a number of measures, namely:

- Ensure reliable power, water, gas, thermal supply and water wastes disposal for dwelling and municipal facilities, industrial enterprises and transport infrastructure;
- Ensure steady development of existing and newly constructed facilities in the sphere of centralized water, gas and power supply, electric distribution networks to reach maximum effectiveness, verified quality and reliability of Saint Petersburg citizens provision with the said resources;
- Provision of power energy should be reached through coordinated development of electric distribution networks and technical upgrading of thermal power plants based on highly effective advance power generating equipment including:
- Putting into operation effective power generating equipment, namely, combined cycle power plants;
- Construction of new 330 kV substations and reconstruction / updating of existing backbone facilities;
- Construction of new and reconstruction of existing 110 kV networks and substations.

**Further, it Is Essential to Foresee:**

- Coordinated development of heat supply networks based on water heating boiler units with capacity over 50 GCal/hr i.e. reconstruction accompanied by obsolete equipment discarding (to be accomplished before the year 2020);
- Construction of new thermal power plants incorporating advanced combined cycle power generating technologies in areas which have power deficiency; construction of new and reconstruction of existing water heating boiler units in city areas with unfavorable situation in respect of centralized heat supply;
- Sectionalizing and cross feeding of thermal networks and district water supply collectors to improve thermal supply system.

To improve drinking water supply system it is required to fulfill the following:

- Increase cumulative capacity of existing water intake and distribution facilities of St. Petersburg to 3 733 000 m<sup>3</sup> water per day by the year 2015 with account to existing and assumed drinking water demands;
- Construction of new and reconstruction of existing step-up water supply stations;
- Reconstruction of existing and construction of new water ducts with sufficient water delivery capacity;
- Construction of interconnecting water ducts between water supply stations allowing to regulate the capacity in accidental cases;
- Relaying, by the year 2015, of entire ferroconcrete water ducts; reconstruction, by the year 2020, of water ducts with interior lining and relaying of damaged water ducts made of carbonated steel; reconstruction, by the year 2025, of worn out cast iron water ducts.
- Water disposal system:
- Reconstruction of existing and construction of new water sewers with sufficient capacity;
- Implementation of sewers reliability improvement measures;
- Finishing of base sewer construction in Northern part of Saint Petersburg (before the year 2020);
- Cessation of contaminated water discharge into water basins through implementation of direct discharges switchover Program (before the year 2020);

- Construction of new and reconstruction of existing sewing ducts involving advanced technologies and restoring their tightness and capacity;
- Construction of surface water sewage regulation facilities with stepped treatment of surface water in areas which have separated sewage system;
- Construction of wastes incineration plant at water disposal plant in Metallostroy settlement. Utilization of entire wastewater sludge by incineration by the year 2015;
- Commissioning of waste water treatment facilities (before the year 2020).

**Gas Supply System:**

- Expansion of Saint Petersburg gas distribution system with gas delivery to prospective housing development areas and provision of gas supply for all consumers which are missing it;
- Construction of base gas supply facilities-gas Distribution Stations-to increase gas consuming capacity and improve reliability of the system as a whole including construction of detached GDSs for newly constructed thermal power plants;
- Improvement of gas distribution system reliability through additional cross feeding of gas distribution networks, construction of new gas supply sources-high pressure gas regulating stations.

Implementation of the aforesaid power energy and infrastructure developing activities will give following results before the year 2030:

- Conformance of utilities and power producing facilities to existing requirements will reach 100%;
- Degree of customers satisfaction by utility services will reach minimum 90% of all interrogated population;
- Capacity of 110 kV transformers network will reach 21 356.0 MBA; installed capacity of thermal power generating facilities will amount to minimum 31 003.2 GCal/hr;
- Production capacity of base water supplying facilities will reach составит 2 million 800 thousand m<sup>3</sup>/day;
- Capacity of water disposal facilities will reach 2 444 000.5 m<sup>3</sup>/day [31].

Therefore, policy towards planning system consists in exercising discipline in management and supervision rather for the sake of public purposes than State Corporation extending their power [32]. Simultaneously with market system development the Strategic Plan of St. Petersburg development includes prices and wages stabilization measures, cross-sector coordination, environment protection activities etc.

### **CONCLUSIONS**

Dynamic model of power producing and engineering infrastructure development forming the base of strategic planning constitutes a complicated iterative process of state planning orientation towards public purposes. We can place emphasis on the following steps to be implemented:

- Monitoring and analysis of basic indexes characterizing each specific region;
- Strategic analysis of specific region interior and exterior medium;
- Determination of targets and missions of regional development with consideration infrastructure preferences;
- Generating of strategic initiatives within market structures regulation perspectives;
- Dynamic analysis of scenarios with account to regional power producing and infrastructure peculiarities;
- Implementation of strategic and operational plans within basic regional economic indexes;
- Correcting and updating of plans with account to Saint Petersburg's dynamic development;
- Organization of professional and public discussion of Strategic Plan basic issues.

All this will allow (and allows today) to implement transition towards new system of state planning not in the interests of one individual state corporation (for instance, Russian railways) but in the interests of large region like Saint Petersburg. Therefore, the conclusions are as follows:

- Actual demands of region's development envisage transformation of Saint Petersburg strategic development Plan in respect of city planning pattern and location of power producing, engineering and transport infrastructure facilities (in this way disciplinary role of city Government should be expressed as assigned by the state);

- Analysis of power producing and engineering infrastructure development in time allows to make a conclusion that strategic Plan of city development should be essentially changed both in respect of infrastructure capacity nonconformity to city demands that have acutely changed for the last time and in respect of social infrastructure (this will reduce corporations powers in the sphere of natural resources use);
- The presented dynamic model of strategic planning allows to observe general perspective and, at the same time, to clearly identify the purpose details: reduction of large corporations power and reorientation of strategic planning towards market structures. Such approach requires modification of Saint Petersburg development Strategy by the city government.

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