King Fahd University of Petroleum and Minerals

City and Regional Planning Department

TERM PAPER:

Introduction of GIS as a tool to monitor existing national programs and prepare future plans for the Republic of Kazakhstan

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Date:	22\01\ 2011

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1. INTRODUCTION

After 70 years of communism, Kazakhstan, being a rapidly developing country faces a lot of sparks of innovation in process management and planning. To manage huge development growth boosted by the oil richness the country is constantly preparing and encouraging planning and vision.

Problem

There are currently nine national development programs in different sectors of economy two of which are ending in 2010 and will be updated. There is also Presidents New Development Plan till 2020 recently approved by the president. The problem mentioned by many analysts and is well known within the government of Kazakhstan is that those programs are not achieving their policy objectives. The recent development plans have proposals for performance indicators, but most of them are aimed towards the end of the plan.

The president and the government want to monitor their implementations however the annual 1 hour presentations by Ministers to the government are limited by the projects and budgets. Recently there is a tendency for any program to have Key performance indicators.

Solution

In the light of technological approach there are two key aspects to the solution of this problem which can be realized using GIS.

1. All the programs need to be analyzed in order to summaries key performance indicators for each for a year to year basis, both qualitative and quantitative.
2. These key performance indicators both direct (such as % of paved rural roads, and indirect such as number of hospital beds per 100 people in the rural area) that are aiming to achieve the program goals should be presented in a comprehensive table based database

and presented in a GIS layers form in order to monitor the regions being the end executors of these programs.

In order to achieve this solution the present paper is outlines basic needs tackling the second listed issue.

2. OVERVIEW OF GIS

GIS is Geographical Information Technology that links information about a feature (such as a construction project, road, land parcel or land use type) to its geographic location. The main difference from database technologies is that GIS is able to relate different information in a spatial context and to reach a conclusion about this relationship. Most of the information we have contains location reference placed at certain coordinates. When a project is implemented under national program it is important to know where it is (roads, school or plant), and what other information is available on that. If we have a map of population in the country and have map for rural schools we can easily layer it over and get a result on % of population with no road access to school within 20 km distance. Similarly we can get maps of number of people with no road access to clinics within 20 km road distance, and we have a road map of paved/unpaved roads, we can see where the links should be built as a first priority.

Technically GIS is merely hardware & software, data and users. Without either of this component working well the GIS will not be performing as required or expected. There are numerous software packages available in the world market, as well as consultancies that are specialized in training for its usage and data collection.

Historically, the analysis was carried out manually using maps, especially for city planning, but it requires huge time and human inputs. Today all the tools are ready in software format, the only task is to create maps and insert data.

The first attempt to introduce GIS in Kazakhstan was a real estate registrar project in 1998 in a small city Pravda, however after spending money the

project was frozen. Second attempt was taken in 2002 by the Land Use Department, which developed a land registration cadastre project for the Capital of Kazakhstan for the purpose of organization and land taxation.

At the time being Arc GIS is actively being presented by the technical consultants to the government. As for the 2008 the Arc GIS was used in oil, security, defense, forestry and land use sectors.

3. IMPLEMENTATION OF GIS FOR MONITORING NATIONAL PLANS

In general GIS is widely used for national purposes by different line ministries and governmental agencies. However, screening through available literature does not give rich pool of results on usage of GIS as a tool for monitoring national development plans and policies. There are two reasons I see for that:

a) The developed world is not in need for such tools as the country programs and master plans are supported by clear action plans with coordination provisions, reporting date and responsible agencies. And most of the reports in the web are for the developed world. This is justified by clear split of powers and institutional arrangements.

b) Not in all the developing countries there are innovative leaders with sufficient powers, to try to implement it at national level. The developers of GIS software and GIS consultants are all from the developed world, not understanding complete picture of bureaucracy and specific cultural issues that take place in some of the developing countries.

i) Overview of possible benefits with GIS based on National 2020 strategy and other plans

Provided that there is software, data and trained personnel the following things can be achieved in Kazakhstan.

A) Monitoring of national plan presidential plan till 2020

The recently approved long term 2020 Presidential plan has 5 main strategic directions:

- Preparation for post-crisis development
- Diversification of the economy
- Investment into the future
- Service for citizen
- International peace

Ideally for a high level politician such as President or Prime Minister these programs in order to be used on GIS platform have to clear split of measures, dates and responsible line ministries and municipalities. Based on GIS this can be presented in the following layers:

1) The Key Strategic Direction
2) The Key Indicators
3) Measures
4) Actions

The idea is that there should be six main layer categories which in addition to the above will include layered databases for:

5) National Plans of Line Ministries
6) Projects

Each category can have of the amount of sub layers that are not limited.

One of the final working layers can be projects, and to illustrate basic view of attribute table data form for the projects category a following columns are presented.

PROJECT	Mid capital repair of Local road Semei-Pavlodar
Description	A capital repair of the road between Semei - Pavlodar due to its unacceptable condition. Road lengh is 324 km, road category III
Type	- select
Respobsible person	Road Commetee, Ministry of Transport
Contacts	8701000000, mtkk@mtc.gov.kz
% of completion	5%
Tender Date	5-Mar-11
Number of bidders	12
Average bid	130,2
Contractor	ТОО "СТРОИ-РОД"
Winning price	125,4
Current stage	The bidding evaluation finished, the contractor selected, the advance payment is done, the preparatory works are finished.
Timing	January 2011 - December 2011
Schedule	*download*
Cost	145,4
Project Economic CBR	2.43
Project NPV	240,4
Project IRR	18.50%
Other key responsible people	Mayor of Eastern Kazakhstan Province

The Projects Layer should have at least 2 sub layers which are called "**TYPE"** infrastructure and non-infrastructure projects.

Infrastructure: Typical infrastructure, new infrastructure, International etc.
Non-Infrastructure: Innovation, Institutional, Procurement, Social, Etc.

The functionality of layers and analytical opportunities provided in the GIS software are too wide to be covered under this task. However the following are very several examples of what could be done with "Projects" layer in addition to what was mentioned previously.

This categorization can enable analysis of how many non-infrastructure innovation projects are implemented under let's say health development plan pursuing Presidents National Development plan with a spatial basis view, as each project will have coordinates.

Having a **brief data** on project description there should be a cell for Project cost, and a cell of economic Cost Benefit Ratio (CBR), NPV, IRR or in case on non-applicability quantitative result of qualitative multi-criteria analysis.

I need to note that for some of the data, while preparing this Kazakhstan National Monitoring System there should be a considerable work to build understanding of layers such as projects cost benefit ratios for the Ministry of economy budge and all related bodies and local governments. One of the steps should be that CBA standards studies carried out by the ministries and standards accepted by the Ministry of economy.
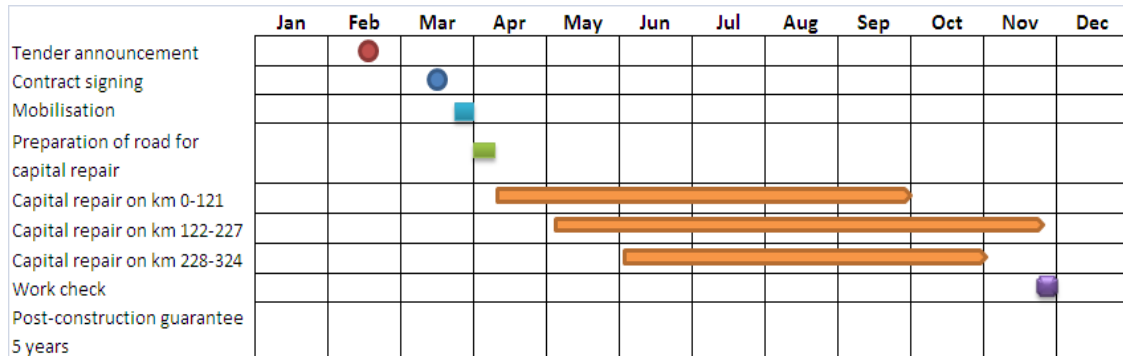
A. This can give politicians a power to see total number with CBR more than 2, and IRR more than 20% and prioritize them in case of shortcomings of fluctuating yearly budgets.
B. As one of the key directions is to fight the corruption, with this tool an analyst can see what projects are non-profitable both economically and financially and drop them in case of limited budgets.
C. When budgets are not sufficient the projects of over 10 mln. USD could be grouped and voted for by the government commission.

In addition to the above one could see what is average Cost-benefit ratio of Ministry of transports projects, and can easily see the projects that score very low in multi-criteria analysis.

As regards to the procurement information a top level official can easily track the company that has the highest number of projects and easily calculate its turnovers and compare with other bidders. Information about the company and its project-performance schedule presented in the following table could be easily made available to the GIS analyst.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tender announcement		🔴										
Contract signing			🔵									
Mobilisation			◼									
Preparation of road for capital repair				◼								
Capital repair on km 0-121				▬▬▬▬▬▬▬▬▬▬▬								
Capital repair on km 122-227					▬▬▬▬▬▬▬▬▬▬▬							
Capital repair on km 228-324						▬▬▬▬▬▬▬▬▬						
Work check											🟣	
Post-construction guarantee 5 years												

For the quarterly reporting a very basic function can give data on number of projects that are delayed, and for every delay the responsible person or body should provide justification. And the average delay for every ministry can be calculated. It could be done in minutes exercises provided that there is data collected.

The government official with necessary powers can enforce the implementation by a comprehensive coordination of the activities.

For every layer, be it projects of indicators there are number of functions providing always an –end-responsibility information on official or body to ask for.

Line Ministry Usage

One of the unique feature of GIS applications is coordination. The implementation on national basis will not only enable the Top level managers to monitor national performance, but also enhance its usage by line Ministries and agencies. A GIS manager can track every regional mayor in terms of number of projects and political measures he is implementing, his performance in terms of delays, and companies that win tenders under the procurement notices of his region. Here are other few examples for the possible usage schemes.

In addition to that he can compare road condition in all the regions, cities. Healthcare access, deaths from certain diseases etc. In reality having the information, the analysis that software allows is very wide.

Ministry of Transport

- Monitoring the condition of national road network for proper allocation of budgets for the poor roads with high traffic.
- Together with Ministry of Agriculture prioritization of budgets for rural roads based on criteria. For instance the roads that need to be paved should be covering rural schools and big hospitals, farms with output of 1000 tons, population of 5000 people/10 km of road etc. Once the criteria are inserted the software will produce the map of all the roads with this conditions and subsequently a political decision can be made.
- Asset management of roads, bridges, railways and airports based on their condition. This will possibly have a form of 5 year plan for asset management according to their historical and today's condition.

Ministry of Agriculture

- Together with ministry of transport can identify the most busy export routes for its products, delays on these routes, optimal routes
- Calculate delays on borders for railway based exports.
- Evaluate the performance of farming clusters. Etc.

Ministry of Health

- Identify cases of epidemia, identify causes and places of concentration of certain diseases.
- Assess the accessibility of doctors and medical units in rural areas as for instance % of population with no access to medical unit within 40 km.
- Calculate different medical services provisions and budgets.

This list can go wider and deeper and be prepared for every single ministry, statistic agency and even Agency of Financial police for crime analysis.

ii) International experience of usage of GIS for national plans

GIS is heavily used in the developed world and developing countries for various purposed, starting with statistics monitoring, going all the way through diabetes concentration ending at number of crimes occurred in special districts of the cities.

Nonetheless there is poor amount of studies available of using GIS for monitoring national development strategies and plans, in fact no direct match was found. However there is a proposal in Indonesia national agency Bappenas responsible for monitoring national development plans progresses. There is also less national initiatives for Malaysia and Qatar.

Bappenas, Indonesia

Bappenas is an agency set at national level that is responsible for coordination, prioritization, monitoring and independent evaluation of development planning at the national level. The responsibilities include financial arrangements (funding prioritization and distribution) for development plans.

The statement from the report informs: - "Recent government and presidential decrees (such as the spatial planning decree) have increased the burden on Bappenas to independently evaluate, monitor and report on projects. Traditional methods of evaluation and prioritization, that relied on paper maps and hardcopy reports, are no longer viable. "

Justified by this paragraph the Bapenass carried out a study of possible use of GIS to monitor the national plans. The outcomes of the study concluded strong necessity, importance and relevance of implementation of GIS for such purposes.

The study was presented specifying 6-month pilot projects and 4 year implementation program budget for the GIS. The first pilots include the following Agencies:

- Directorate of Energy communication and informatics
- Ministry of transport
- Directorate of water management and irrigation
- PPP Directorate

The preparation of the study involved several participants and included survey of government representatives.

Negeri Sembilan, Malaysia

Being a State in Malasia, the State of Negeri Sembilan developed their own GIS-based special purpose planning support system to monitor the implementation of state development plans. A peculiarity of this software is that was developed for this purpose for operation on two levels of planning –state and district level. It was not developed merely to analyze alternative spatial development strategies but also to visualize development potentials for the region. As a result of collaborative efforts and data sharing from government agencies the project was established and provides updating facilities and interactive display. As a second purpose, there was a special monitoring system developed for two mentioned levels - state and district to monitor the success of the implementation. The Negeri Sembilan project provided impulse to built strong coordination between intergovernmental agencies and departments.

Qatar National Master Plan: GIS approach and experience

The Qatar experience is not directly related to national level as it is prepared for two municipalities that are in the structural plan. Urban planning and development authority has initiated GIS tools for the preparation and monitoring for their Master plan.

iii) Implementation in Kazakhstan

Based on the experience of the two cases studies mentioned above, and having identified strong need for GIS usage for monitoring plans in Kazakhstan a step by step set of actions has to include the following.

In case of necessity to justify the funds for the study a feasibility assessment can be made by the government, however it is difficult and almost impossible to assess economic impact of GIS for each purpose, as it is not a regular project.

Step 1 – identify within existing government structure or create new unit with sufficient powers to carry out the implementation

- Within Kazakhstan governmental system it will be hardly possible to organize data sharing unless there is a certain unit coordinated by high level authority, with sufficient funds for international experts
- There are several National Think Tanks under the Prime Minister's office with sufficient funds and adequate intellectual and physical capacity such as "National Analytical Centre under the Government of Kazakhstan" with English speaking environment and reporting directly to Prime Minister

Step 2 – preparation of Terms of Reference and Technical specification of GIS implementation consultants

- Identifying "proper" coordination group from the ministries that would consist of specialists at a minimum deputy-director of department level for participation in workshops
- Drafting terms of reference of GIS project and parallel to it identification of international consultant and team of local experts that will be involved and will be future managers and trainers

Step 3 – reserving funds and capacity building

- Having securing funds and during implementation of the project a large training campaign and awareness meetings with all the related civil servants from central and local governments should be carried out to build understanding and have feedback on project goals and working frameworks.

While GIS is spatial system, there can be a question why GIS and why coordinates, while it seems it will be mostly data tables and queries. Will not it be sufficient to build database management software?

As in the development of the national plan 80% of the projects and initiatives are laid on municipalities and budgetwise heavy infrastructure such as roads (local and national) and railways need coordinates it needs to have coordinates.

The GIS is coming and will be a tool for planning in the future in Kazakhstan, and it is now time to teach the ministries and municipalities this sophisticated tool of using GIS for planning, as its implementation is very broad.

We need to build a national GIS system, which in future will include comprehensive data on population, incomes, governmental services etc. for cities and provinces based on this single general format. As for today there are different projects by oil and defense sectors which do not go in parallel and although they might have similar data the format is different and quarrying analysis is thus very limited.

Timing and Resources

The implementation of GIS is not a 6 month or 1 year exercise. Depending on the tasks, organizational structure, political commitment and funding it can be from 2 years to more. It is then up to the government to identify what exactly is needed from GIS at the initial stage and what at a latter stage.

The resources include

1) Skilled international consultant(s)
2) Trained local experts
3) Computers with software (license costs are provided in the attached cases study for the Indonesia)
4) Offices and logistics, workshops etc.
5) Other related activities

CONCLUSION

In conclusion, it is very relevant from the point of view of time and political necessity to introduce GIS at a national level in Kazakhstan, and stimulate the local and central governments to shift from paper based approach to IT.

According to IT jobs Watch, the demand for GIS analyst is steadily increasing, although being hit by the crisis in 2006-2009, as illustrated in the graph:
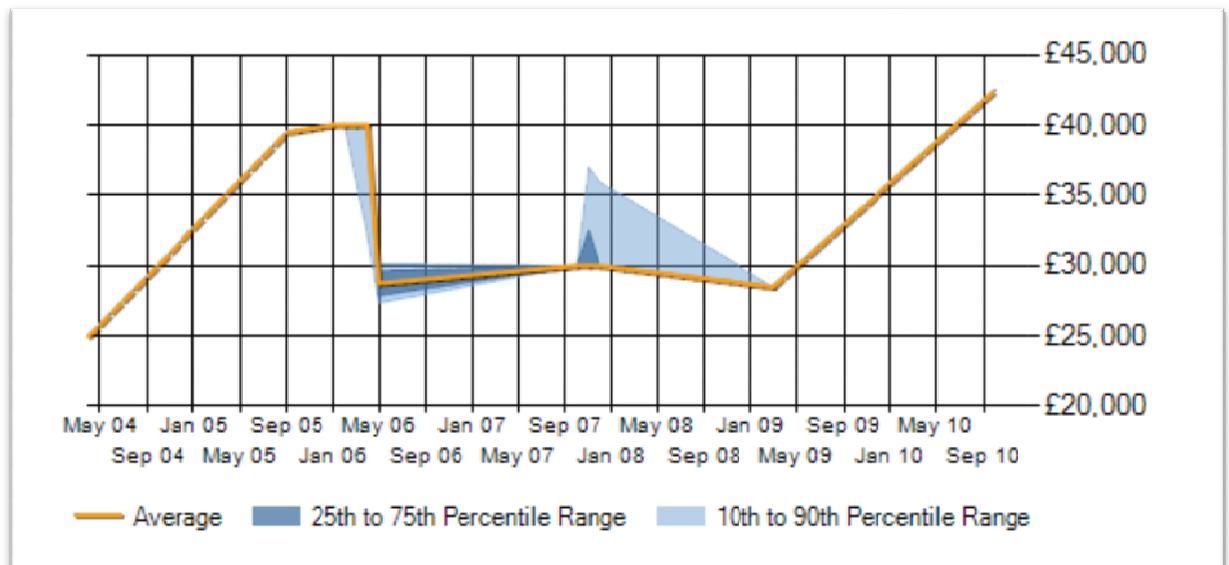
Source: www.itjobswatch.co.uk

Kazakhstan can be one of the first countries to use GIS for monitoring purposes. It is in fact very innovative initiative to introduce GIS to Kazakhstan through Monitoring of national plans.

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Web-sources:

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- http://www.itjobswatch.co.uk/jobs/uk/senior%20gis%20analyst.do
- http://www.government.kz

ANNEX: Report "GIS for Infrastructure Development: Recommendations for Bappenas", Australia Indonesia Partnership, Indonesia Infrastructure Initiative