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**REPORT No 10**

**RECOMMENDATIONS FOR CRE-  
ATING ACTUARIAL CAPACITY  
TO SUPPORT SOCIAL INSUR-  
ANCE REFORM IN ARMENIA**

Prepared by  
**PADCO Armenia Social Transition Program**

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PLANNING AND DEVELOPMENT COLLABORATIVE INTERNATIONAL

*Development Solutions for the 21<sup>st</sup> Century*

## PREFACE

Under USAID Contract No. 111-C-00-00-00114-00, PADCO is providing assistance to the Government of Armenia on social sector reform issues. Under Task 1B:T3, PADCO is assisting the GOA to develop actuarial models for social insurance programs and to develop a sustainable actuarial education and training program.

Reform of the old age pension system, the invalid pension system, and the creation of health insurance must be based on reliable financial projections of the revenues and expenditures of the insurance funds. These projections must be made using actuarial models. For pension funds, the AST proposes to assist the GOA to develop a model based on the World Bank PROST model. This model has been developed by the Bank and applied to making financial projections of pension systems in dozens of countries. Licensing agreements from the World Bank for Armenian specialists will be signed as a pre-condition for using this model in Armenia. In addition, the AST team proposes to work in collaboration with the World Bank to provide training in the use of the model.

To assist the GOA in developing this actuarial capacity, the PADCO Armenia Social Transition Program has prepared this report. It describes three aspects of developing actuarial capacity:

1. Developing a permanent education program to prepare actuaries according to international standards.
2. Developing an actuarial model of the state old-age pension system and training specialists in the Social Insurance Fund and the Ministry of Social Security in the use of this model.
3. Creating an Office of the Actuary to provide actuarial estimates for social insurance programs

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## 1. INTRODUCTION

To design and implement successful reforms in Armenia's social insurance systems and to manage those systems effectively in the future, the Government of Armenia must develop the capacity to undertake financial projections of the revenues and expenditures of its social insurance systems. These models are known as "actuarial models" and the specialists that use these models to prepare forecasts are known as "actuaries". Developing the necessary capacity for financial modeling in Armenia involves three separate tasks: 1) creating a permanent education program to prepare actuaries to work in government or in the private sector; 2) designing reliable financial models to make forecasts and training specialists in the use of these models; and 3) creating an Office of the Actuary where trained specialists will conduct financial analyses for social insurance funds.

The creation of actuarial capacity in this way will serve more than the needs of Government of Armenia for implementing reforms in the social insurance system. It will improve the administration of social insurance systems and will lay the foundation for the emergence of a viable private insurance industry.

This paper is divided into three parts. The first part describes what is an actuary and outlines a plan for the development of a permanent program for the education of actuaries within an educational institution in Armenia. This education program is aimed at developing Armenian actuaries capable of meeting international standards for the actuarial profession.

The second part of this paper outlines a plan for the development of an actuarial model of the state old-age pension system based on the PROST model for old-age pensions developed by the World Bank. This step-by-step process will have to be replicated for other social insurance programs including invalid benefits, insurance for workers injured at work, and any health insurance program that will be developed to finance health care services.

The third part of this paper describes how the GOA could establish an "Office of the Actuary." This office will administer actuarial models and ensure that models are used in accordance with international standards of actuarial practice.

## 2. CREATING AN ACTUARIAL PROFESSION IN ARMENIA

### 2.1. WHAT EDUCATION AND SKILLS ARE NEEDED TO BE AN ACTUARY?

Actuaries must have a strong competence in mathematics. Many actuaries have university degrees in mathematics, and many countries offer degree programs in actuarial science. In the West, actuaries are required to pass a stringent series of exams in order to be considered a credentialed actuary. In the United States, there is a series of 10 exams that must be passed. The very first exam covers one, two and three dimensional calculus and linear algebra. The second exam covers probability and statistics using calculus. The third exam involves financial and present value concepts, and the fourth exam focuses on actuarial mathematics. Essentially, actuarial mathematics results from combining probability and statistics with financial mathematics. A solid background in calculus is a prerequisite for an actuarial career. Someone with the proper mathematical aptitude and knowledge can learn the rest with extensive study and experience.

It is also helpful, but not mandatory, to have a broad background in business-related subjects such as economics, accounting, law, business organization and business finance. The later actuarial exams in the United States test many of these topics. In addition, a great deal can be learned while working.

### 2.2. HOW ARE ACTUARIES TRAINED IN THE NORTH AMERICA AND WESTERN EUROPE?

Training of actuaries in North America and Western Europe is a combination of examinations and practical experience. Both are necessary. The examination program provides a full background in all aspects of actuarial work, both mathematical and practical. The exam program is rigorous and time consuming. In the United States, a series of 10 exams must be passed to be fully credentialed. On average, it takes most actuaries about 10 years to pass all the exams. Many actuaries never complete all the exams, and either leave the profession or have a lesser role in the profession. Normally these exams are taken while working full-time in an actuarial career, although it is common to pass the first one or two exams while still attending university. A great deal of dedication and discipline is required.

However, theoretical knowledge without practical experience is not very useful. Things in the real world are rarely as straightforward as in a textbook. It is essential for an aspiring actuary to be involved with actuarial issues on a daily basis. Participation in the preparation of actuarial valuations, special studies, experience analysis and other actuarial activities is essential. The work must be done under the guidance and direction of an experienced pension consulting actuary.

### 2.3. HOW CAN ARMENIA DEVELOP AN ACTUARIAL PROFESSION?

In the short term, Armenia will need to develop actuaries through training on the job. Interested candidates with strong backgrounds in mathematics and an interest in actuarial science must be identified by potential employers. These individuals must be employed on a daily basis doing actuarial work under the guidance of an experienced senior actuary. The most likely place for employment in Armenia would be either in state social insurance funds or working for large international insurance companies. Since there are few insurance companies in Armenia that employ actuaries at this time, the creation of the Office of the Actuary (section 4 of this paper) will be essential for the immediate development of actuaries in Armenia – as well as being critical to the proper administration of social insurance funds. It may be possible to arrange for local candidates to work, temporarily, in large foreign insurance companies outside Armenia to acquire practical experience.

In the long term, actuaries must be prepared by enrolling in specially designed actuarial education programs located within a respected education institution in Armenia. In many countries, these programs involve a two-year series of classes with strict, independently administered, qualifying examinations upon completion of classes. The AST team has met with the President of Yerevan State University, who has expressed a strong interest in creating an actuarial program. Yerevan State University will have a memorandum of cooperation with Kyiv Shevchenko University in Ukraine, which has already developed a strong actuarial education program in collaboration with AST consultant actuaries Mitchell Wiener and Vitali Lukovich. The AST Program will investigate the possibility of using professors from the Kyiv Shevchenko University to collaborate with Yerevan State University on the development of curriculum and academic training in order to develop a comparable program in Yerevan.

There are many English or Russian texts that can be used for self-study. However, it would be best to establish a university program in actuarial science here in Armenia, and develop a strategy for accrediting local actuaries. Professional credentials are essential if the actuary is going to be accepted and recognized in the international community. In the short run, Armenia may want to use recognized and accredited academic courses as a substitute for a separate examination program. However, in the long run, Armenia needs to develop its own independent, and stringent actuarial examination and accreditation program. As in other several countries in the former Soviet Union, this accreditation process can be based on internationally accepted actuarial standards promulgated by the International Association of Actuaries.

<b>WORKPLAN FOR DEVELOPING AN ACTUARIAL PROFESSION IN ARMENIA</b>		
<b>Task</b>	<b>Dates</b>	<b>Responsibility</b>
<i>Task 1: Create Legislative Framework for the Profession of Actuary</i>		
1.1. Add actuary to list of professions in Armenia, and get Ministry of Education approval to add it to list of approved courses of study	March 2001	GOA – with support from PADCO
1.2. Design and enact the necessary normative acts to create and regulate the actuarial profession	Sept 2001	GOA, PADCO.
1.3. Develop qualifying examinations and certification procedures for actuaries	Sept 2001	GOA, PADCO
1.4. Decide on strategy for establishing and enforcing professional standards of conduct	4Q 2001	GOA, PADCO
<i>Task 2: Build the Institutional Foundation</i>		
2.1. Identify universities and institutes interested in and capa-	Jan 2001	GOA and Presidents of education

<b>WORKPLAN FOR DEVELOPING AN ACTUARIAL PROFESSION IN ARMENIA</b>		
<b>Task</b>	<b>Dates</b>	<b>Responsibility</b>
ble of developing academic programs in actuarial science (Yerevan State University appears the most promising candidate at this time)		institutions – with assistance from PADCO
2.2. Develop plan for location of actuarial education program within institution, the design of curriculum, and the preparation of educational materials	March 2001	Presidents of educational institutions
2.3. Develop curriculum, staffing plan, and facilities for the academic program in actuarial science	March 2001	GOA, PADCO
<i>Task 3: Build the Human Capacity within the Institution</i>		
3.1. Identify professors who will provide actuarial courses	March 2001	Presidents of educational institutions
3.2. Develop plans for educational enhancement to provide professors with experience in practical aspects of actuarial work	June 2001	Faculty, PADCO, AED
3.3. Develop internship plan for students to work with local companies, social insurance funds, and international companies	June 2001	SIF, MOSS, SHA, Faculty,
3.4. Prepare course materials and examinations to ensure that it meets international actuarial standards	Sept 2001	Faculty with PADCO support
3.5. Prepare classrooms with computers and other resources	Dec 2001	PADCO support
3.6. Begin first actuarial education program	Jan 2002	Institution, faculty
<i>Task 4: Implement the New Education Program</i>		
4.1. Select qualified students	Sept 2001	
4.2. Implement new courses with internships etc		

### **3. DEVELOPING AN ACTUARIAL MODELS IN ARMENIA**

#### **3.1. WHAT IS AN ACTUARIAL MODEL**

##### *3.1.1. Inputs, Outputs, and the Structure of the Model*

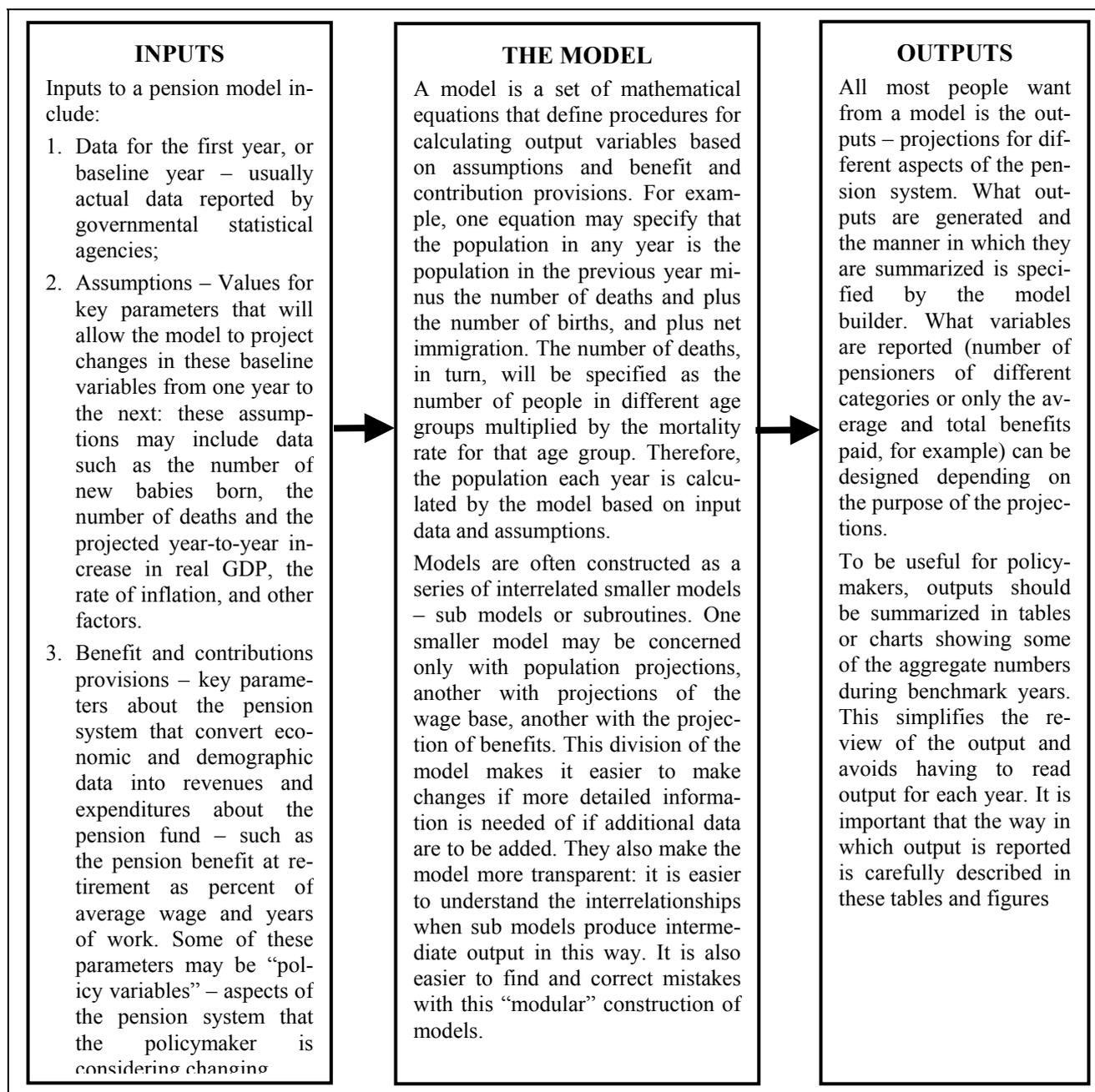
An actuarial model is a series of mathematical and behavioral relationships that convert “inputs” into financial projections of revenues and expenditures of a social insurance program. Inputs include data on current economic and demographic conditions, assumptions about the future changes in these inputs and a mathematical “description” of the provisions of the social insurance system. For a pension model, inputs would include the number of elderly people today, the number of working people, the average wage, and other important aspects of the population and economy of Armenia. The discussion in this section uses, as an example of an actuarial model, the application of such a model to than old-age pension system. But the basic principles would apply equally to a model of other social insurance programs such as invalid benefits, workers’ compensation, and health insurance.

The key provisions of the social insurance system that must be included among the inputs are the eligibility requirements for receiving benefits, the formula under which benefits are calculated, and contribution rates paid by enterprises (together with any maximum contributions, exemptions and other characteristics of the payroll contribution system). One of the major uses of using the actuarial model is to forecast the financial impacts of changing these policy variables. In Armenia today, for example, the contribution rates to the solidarity system, maximum and minimum benefit levels, the accrual rate, and the wage cap on contributions are

all important policy variables. Once the model is created it will also serve the administrators of the fund to administer the system and to protect against operating the fund in a deficit.

Outputs are the results achieved from “running the model” and are what policymakers tend to focus on. Policymakers will want the model to answer such questions as: Will the state pension system be in fiscal balance over the long run? How much will the pension fund collect in revenues and spend on benefit distribution next year? In five years? In ten years? What level of benefits will working people today receive when they retire in 5 years time, in ten years, or in twenty years? What is the implicit rate of return that these future pension benefits represent when compared with the contributions being paid on behalf of those individuals? How will the pension system affect welfare, labor participation in the formal sector? How will it affect the overall growth rate of the economy? Outputs from these models, combined with other information, assumptions, and values, can be used to answer these questions.

Policymakers must understand that the assumptions made about economic relationships and the quality of the



data entered into the model affect directly the outputs generated by the model. To put the model’s output in

proper perspective, policymakers must spend an equal amount of time studying the inputs, and these inputs must be clearly documented as an integral part of the presentation of outputs.

Model users should also be concerned with some of the “intermediate results” of the model – results generated by the model as interim steps toward making the final calculations. Careful study of these intermediate results will often reveal flaws in the set of input assumptions and policy variables, and will explain apparently aberrant financial projections. For this reason good actuarial models provide intermediate outputs – showing, for example, projections of changes in the population, the workforce, the number of contributors, the number of pensioners, and average pensions over time. For example, the population of Armenia today is entered into the model as an input. The population in the year 2040 would be calculated by the model as an intermediate step in the calculation of future revenues and expenditures of the pension fund.

Policymakers must check key input assumptions to decide if they are reasonable. Models do not generate projections from input variables by magic. Projections are based on the assumptions and the coding of the primary benefit provisions of the law – and computers cannot check the reasonableness of either. Therefore, the assumptions on which models make their calculations, and the methods by which the provisions of the law are implemented must be made explicit, so users will understand what is represented by the model’s output. The figure above summarizes the basic characteristics of inputs, the structure of the model, and outputs.

There are literally dozens – sometimes hundreds – of assumptions necessary for constructing any model. For example: How will the number of children per family change over time (if at all)? How will minimum and maximum pensions be adjusted each year? How many people aged 50 to 55 will work and how many will receive either privileged or invalid pensions? In accordance with international actuarial standards, an actuarial model must start with an accurate representation of the current legal provisions of the pension system. This will be the starting point for all further analysis. We may then assume either that the present law continues to apply in the future or we may assume that policymakers make periodic changes. However, before studying changes to the pension system, it is critical to have agreement on the financial projections for the current pension system under the current pension law.

### *3.1.2. Types of Models*

There are various types of models. Economists often divide types of models into two categories – “actuarial” models and “behavioral” models. Actuarial models show basic accounting relationships. For instance in the case of modeling the pension system, actuarial models show the deficit of the PAYG system as the difference between revenues and expenditures. Revenues and expenditures are calculated based on probability tables projecting birth and death rates and other assumptions. The World Bank’s PROST model is an actuarial model.

Behavioral models are conceptually more complicated than accounting models. In addition to projecting accounting relationships, they also try to project the behavior of people and enterprises. How much will individuals work, consume, and save? How much will enterprises produce, and how much capital and labor will they use in production? Such models are usually based on mathematical equations derived from economic theory of profit maximization by enterprises and utility maximization by individuals.

It is important to emphasize that any model is simply a way of using a computer to make a series of calculations quickly and efficiently. If the model is provided with reasonable inputs and if it is correctly structured (that is, it performs the correct mathematical operations on these inputs), it can make reasonably accurate short-term projections. But the very ease with which models can generate new projections also causes problems with their proper use. First, models that are not built correctly – that is, models within which some of the mathematical relationships are not correctly specified – can easily produce misleading results. Second, models can be easily manipulated to provide their users with whatever result they want to produce.

Even relatively simple models contain hundreds of functional relationships. For example, projections of the total population of Armenia must be used as the basis for calculating the number of contributors to the pension system and also to calculate the number of pensioners. Once these relationships have been specified in the computer, they are “hidden” and play their part invisibly in generating the final output shown in summary tables. These errors in specification may be difficult to detect. They may produce errors in final projections that are relatively small in most instances.

There are three ways to deal with the problem of errors.

1. Build a transparent and clear model. The model must be designed and built in a way that is as transparent as possible. In a popular phrase, the model should be “user friendly”. Making a model “user friendly” requires designing all aspects of the model – from the pages where inputs are entered through the tables that report on the intermediate calculations, to the way that the output is presented – with a view to the use of the model by a broad group of people. The model should not be a personal structure that can be understood only by its designer. Wherever possible, the labeling of variables should be clear, and the model should certainly be available in the language of the host-country users. All parts of the model should be easily accessible to anyone who wants to examine them.
2. Review of the model by other specialists. The model should be reviewed and tested by other experienced model builders and users. Review by qualified experts is not something that can be done in one or two hours. Because models are complex, they must be reviewed carefully.
3. Use the model a lot. The team of model users should become familiar with the model by using it to prepare output under many different assumptions (inputs), giving them an opportunity to identify aberrations in outputs. When results are prepared for policymakers, output should be carefully reviewed by the team using the model for glaring inconsistencies. Models will be employed daily – in preparing and adjusting budget forecasts for the social insurance fund, in analyzing policy options, in preparing sensitivity analyses. The trained actuaries working in the Office of the Actuary (see the following section of this paper) will gain greater familiarity with their actuarial models if the major responsibility or using models is concentrated in a single place.

When a serious error is discovered in previous projections of the model, it is important that the nature and extent of the errors be explained carefully (in writing) to people who had been using the erroneous results of the model in designing new policies.

### **3.2. HOW SHOULD POLICYMAKERS USE ACTUARIAL MODELS**

Under pressure to prepare social insurance reform quickly, policymakers may be tempted to demand “overnight” results from models. They may ask for projections of the financial consequences of eliminating privileged pensions or changing the accrual rate without, perhaps understanding that this is a complex task. Policymakers may also not specify carefully what implicit assumptions they are making in considering raising pension ages. For example, they may assume that all privileges granting early pension ages to some workers will be eliminated – or they may be assuming that people will be allowed to retire early but subject to some penalties.

The result of the failure to specify all the assumptions that should be made in preparing a particular projection is that different models yield apparently very different results. The differences may be largely explained as the result of different assumptions made by the model builders in the absence of specific instructions from policymakers.

Policymakers may also fail to specify the result they are most interested in receiving. They may ask, for example: “What will happen if the pension age for women is raised from 55 to 60 years?” But what are they interested in knowing? Are they most concerned about what will happen to the fiscal balance of the system (revenues minus expenditures)? If so, in what year – 2005, 2020? 2040? Or accumulated over time? The fiscal balance in any single year can be very misleading because of changing demographic conditions. But if balances each year are accumulated over time, the model maker needs to specify an interest rate. Perhaps policymakers are more interested in how the change will affect the numbers of women pensioners or how the increase will affect the relationship between contributions to the system and the benefits received from the system? Specifying what you want to know from projections is as important as specifying the assumptions upon which those projections are based.

Policymakers should also beware of basing conclusions on a single projection. Looking at what will happen to the net financial balance of the pension system over a 50-year or 75-year period if the pension age is raised from 55 years to 60 years, for example, is less useful for making difficult political decisions than knowing what will happen if the pension age is raised to 58 years, 59 years, 60 years, 61 years and 62 years, for example. The latter analysis allows policymakers to know the gain for each additional year by which the pension age is raised – an important factor when balancing delicate political questions. In other words, both the absolute impact and the marginal impact of proposed policy changes are important. Sensitivity analyses are the best way to prepare for major policy changes.

The four rules for using pension models are, therefore:

1. Give model users enough time to prepare projections carefully and review results before the results are submitted to policymakers;
2. Specify all assumptions that should be included in the model when making projections -- preparing in consultation with the model user the standard form described in Attachment 1 will minimize confusion;
3. Specify how the projections should be summarized – preparing – perhaps in consultation with the model user, the standard form described in attachment 2 will minimize confusion; and
4. Specify a range of values for the key policy variable for which projections should be prepared.

Specifying the assumptions and input variables and the characteristics of output variables of models is not unlike the disclosure of the contents of packaged food or medicine. It requires the manufacturer to label clearly the contents of the package, and it protects the customer from inadvertently receiving something they did not wish to purchase.

<b>WORKPLAN FOR DEVELOPING A PROST MODEL FOR ARMENIA'S PENSION SYSTEM</b>		
<b>Task</b>	<b>Dates</b>	<b>Responsibility</b>
<i>Task 1: Secure Licensing Arrangement from World Bank for Armenian Specialists to use PROST model</i>		
1.1. License selected GOA agencies and specialists to use PROST model	Jan/Feb 2001	World Bank
<i>Task 2: Prepare PROST model for Projections in Armenia</i>		
2.1. Translate PROST model to Armenian	Dec 2000	PADCO
2.2. Translate actuarial exam to Armenian	Dec 2000	PADCO
2.3. Code PROST model for current pension system in Armenia	Jan 2001	PADCO will prepare the coding. The GOA will provide needed statistical information
2.4. Prepare a report summarizing the methods and assumptions used in the actuarial analysis of the current Armenian pension system	Feb 2001	PADCO will document all methods, assumptions and results in accordance with American professional actuarial standards
<i>Task 3: Provide Training to GOA Specialists in Use of PROST Model</i>		
3.1. Identify potential candidates for actuarial training	Jan 2001	GOA. Attachment 1 to this paper suggests academic and professional experience to be considered in selecting candidates
3.2. Give examination to potential candidates and identify those qualified for training	Feb 2001	PADCO
3.3. Training of selected actuaries in the use of the PROST model	Feb 2001	PADCO, World Bank
3.4. Training of selected actuaries in basic actuarial mathematics	2Q-4Q 2001	PADCO

We suggest the following procedures for identifying actuarial candidates for training in the use of the PROST model:

- Specific written qualification requirements should be drafted. Attached to this memo are our suggested requirements.
- We suggest all interested candidates to submit a CV to the GOA. The GOA will then review all CV's and decide whom to invite for testing. As part of the interview, all candidates will be required to take a mathematical test and computer skills test. PADCO will prepare such an examination for your review based on standardized material used for actuarial examinations in the United States. We propose this material be reviewed by the local actuarial school to be sure it is appropriate for Armenia.

- The GOA may wish to consider placing an advertisement for these positions in general publications, and at universities and institutes with strong mathematics faculties.
- A brief test of computer skills should be considered, especially in the use of Excel.
- It would be helpful – but it is not mandatory – if at least one of the trainees spoke English.
- We can assist the GOA with review of all CV’s and help with candidate interviews.

## **4. CREATING AN OFFICE OF THE ACTUARY IN THE GOA**

### **4.1. INTRODUCTION**

The GOA must quickly establish an Office of the Actuary as the pre-condition for developing concrete proposals for social insurance reform. When the office is first created, it will have a relatively small staff of trained actuaries. These should be located in a single place. As the “supply” of actuaries is increased – from the graduating classes of the formal education program described in section 2, above – then “branch offices” can be established in the SIF, in the State Health Agency, in the Ministry of Finance, and, perhaps, eventually in the National Assembly. The initial concentration of trained actuaries in a single location is necessary to maintain quality control over the use of actuarial models and to allow the actuaries to learn from each other.

### **4.2. STAGE 1: CREATING AN OFFICE OF THE ACTUARY FOR OLD-AGE PENSION PROJECTIONS**

Armenia’s solidarity system is a defined benefit program, with benefits determined by a formula and contributions collected through payroll contributions paid by legal entities on behalf of employees. The system is currently experiencing severe financial difficulties – with pension arrears, poor compliance in paying payroll contributions, low benefits, and a high payroll contribution rate. Consequently, significant financial analysis and reform are needed immediately. Consequently, an appropriate actuarial and financial model must be built, projections of revenues and benefit payments under the current system must be made, and different reform scenarios must be analyzed. So now is the time to create and fund an Office of the Actuary. The USAID Social Transition Project has an experienced, credentialed, U.S. actuary – Mitchell Wiener – on its staff, and he can help create and manage the Office of the Actuary, and prepare the necessary financial and actuarial analysis. The primary responsibilities of the Office of the Actuary include the following:

#### *4.2.1. Prepare, publish and present an actuarial valuation report each year*

An actuarial valuation report is an analysis of the financial condition of the pension programs as of a specific date. Typically, this report is prepared using data and assumptions that are appropriate as of either the first day of the calendar year or the first day of the fiscal year. Whatever date is selected should be used every year. The date should be selected so that the results are available in time to be used in preparing the following year’s State Budget. The primary purposes of the report are to:

- Provide cash flow forecasts
- Measure the system’s unfunded liabilities
- Evaluate the long-term actuarial stability of the system.
- Provide the actuaries opinion regarding the financial status of the system
- Comment on any changes that the actuary feels should be made to preserve the financial integrity of the pension system.

The report should also include full and complete disclosure of all information, methods and assumptions included in the report, and an actuarial certification of the results.

Preparation of this report requires a great deal of data and actuarial assumptions regarding macroeconomic, demographic, and labor market expectations for the future. The final report should be published and made available to all citizens.

#### *4.2.2. Prepare fiscal analysis of all proposed changes to the system.*

One of the most important responsibilities of the Office of the Actuary is to prepare a fiscal analysis of all proposed changes to the pension system. Legislative bodies should have a full and complete analysis of the long and short-term fiscal consequences of any changes to the pension system before voting on pension legislation. Most legislative bodies anywhere in the world are inclined to provide pension benefit increases be-

cause the financial consequences of the changes will usually not become apparent for many years, while the short-term political gains can be great. Consequently, many jurisdictions have laws that require a complete fiscal analysis by the pension system's actuary before any pension legislation can be passed. We strongly suggest such a provision be adopted in Armenia as well.

#### *4.2.3. Prepare experience studies*

In order to prepare accurate financial forecasts, the best possible data and assumptions should be used. The Office of the Actuary is usually required to prepare experience studies periodically to assist with this process. For example, in preparing an actuarial forecast, assumptions must be made regarding mortality rates for different types of retirees, disability rates by type of disability, and rates of retirement by age and sex. It is common in many jurisdictions to require a detailed analysis of actual experience every 3 to 5 years. Actual results are then compared to what was expected, based on the actuarial assumptions. The result of this analysis is then used to review and evaluate the current actuarial assumptions. The results of these studies should be published and made available to all citizens.

#### *4.2.4. Recommendations regarding assumptions and methods*

All actuarial assumptions and methods should be reviewed periodically to make sure they are still appropriate. Typically, a quick review is done every time a valuation is completed and a more thorough review is completed every 3 to 5 years. The review of the assumptions may be coordinated with the completion of an experience study. The actuary should make recommendations to the government regarding any changes in assumptions or methods that he deems appropriate.

#### *4.2.5. Work with government agencies to develop needed statistics and data bases*

Many times, the actuary will find that the data and statistics he would ideally like to have are not available. This occurs regularly in the United States, and is an even more serious problem in the former Soviet Union. It is important for the actuary to work with the appropriate government agencies to explain to them the data that are needed, why the data is important, and to develop a plan to gather the needed data in the future. The process of preparing financial forecasts of the pension system is not a static process. It is a dynamic one. The goal is to continually improve the process each year. Improving the quality of the underlying data is a critical part of this process.

#### *4.2.6. Perform special studies for the government as requested*

The Office of the Actuary will normally consult with the government on a regular basis regarding policy issues and the day-to-day operations of the pension program. The actuary will typically prepare special studies for the government as well, so the financial impact of possible system changes can be evaluated long before a decision is made to seek legislative approval for the changes. These may involve changes in eligibility conditions, benefit levels, changes to privileged pension conditions or any other aspect of the pension program.

#### *4.2.7. Pension system administration*

The actuary is often involved in advising the government on administrative procedures for the pension system. For example, the actuary may assist in the design and testing of benefit calculation software, help develop policy manuals, assist with the development of standards for evaluating disability, and work with attorneys to draft legislation that can easily be interpreted and administered.

The public pension program is in desperate need of regular, ongoing actuarial analysis. This is especially true at this moment, since the system is in crisis, and pension reform is needed now. International donors, such as USAID can provide support, training and technical expertise in the short run. But ultimately, Armenia's pension system needs to have its own actuaries and develop its own technical capabilities. So we suggest you consider the following steps:

- Establish an Office of the Actuary immediately;
- Identify and dedicate full time staff to the organization. At least 3 or 4 individuals will be needed;
- Use an international actuarial expert as the de-facto head of the Office for the first few years;
- Quickly build one actuarial model and prepare baseline projections for the current pension system using data, methods and assumptions that are acceptable to the government. Multiple models will be confusing to everyone, and will slow down the entire pension reform process. We suggest the World

Bank’s PROST model. It is well tested, and is maintained and updated on a regular basis by a full-time staff;

- Prepare a full actuarial valuation report documenting the results of this analysis;
- Form a Working Group with broad representation of all social partners and other interested group from within and outside the government. Identify the goals and objectives of your reformed pension system in a draft concept paper. Select several design alternatives that meet those goals and objectives. Use the PROST model to prepare financial analysis of those alternatives;
- Analyze the social impact of the proposed alternatives on different groups of citizens – existing retirees vs. future retirees, urban vs. rural, males vs. females, poor vs. rich, etc.;
- Analyze the legal, regulatory, administrative and public relations challenges posed by each proposed approach. Identify in detail, the pre-conditions that must be met for the new system to be successful;
- After selecting an approach, prepare a very detailed concept paper outlining the provisions of the reformed pension system, and include detailed financial analysis. Publish the concept paper and encourage comments from all interested parties. Carefully review all comments received;
- Finalize the concept paper and financial projections; and
- Prepare draft legislation and other normative acts to implement the proposed pension reform, and submit the package to Parliament for consideration.

#### 4.3. STAGE 2: EXPANSION OF THE OFFICE TO OTHER MINISTRIES

Focusing on pensions is only the first step in creating an effective actuarial capacity on the GOA. It ensures that the four or five actuaries-in-training have a focused task that can be supported by an experienced ex-apt actuarial advisor. The SIF already prepares many of the reports that will provide the necessary inputs to the calibration of the model. In addition, the World Bank has a reliable and fully-supported actuarial model for pension systems for which formal training programs are available.

But, in the long-term, all of Armenia’ social insurance programs will need actuarial support. In the process of supporting the implementation of he tasks described in this workplan, the AST will prepare a plan for the expansion of actuarial capacity to other funds. This “stage 2” workplan ill address the specific needs for the following social insurance programs:

1. Invalid benefits;
2. Workers compensation;
3. Unemployment insurance; and
4. Health insurance – if and when a true health insurance program is developed based on contributions rather than on simply state budget funding for health care.

In addition to the development of actuarial capacity for social insurance, the AST team will also assess the need for and opportunities for the creation of actuarial capacity within the Ministry of Finance.

<b>WORKPLAN FOR CREATING OFFICE OF THE ACTUARY</b>		
<b>Task</b>	<b>Dates</b>	<b>Responsibility</b>
<i>Task 1: Create Institutional Framework</i>		
1.1 Design institutional framework for Office of the Actuary	Jan 2001	GOA, SIF, with PADCO support
1.2 Issue necessary normative acts to create Office of the Actuary	Mar 2001	Designated agency – with PADCO support
1.3 Develop strategy for paying a competitive wage to Office of the Actuary employees	Mar 2001	GOA
<i>Task 2: Create Institutional Framework</i>		
2.1 Assess equipment needs for Office	Mar 2001	Designated agency with PADCO support

<b>WORKPLAN FOR CREATING OFFICE OF THE ACTUARY</b>		
<b>Task</b>	<b>Dates</b>	<b>Responsibility</b>
2.2 Procure and install equipment	May 2001	Designated agency with PADCO support
<i>Task 3: Create Human Resource Capacity</i>		
3.1 Train staff – see preceding section		

## **ATTACHMENT 1: PROFESSIONAL QUALIFICATIONS FOR STAFF OF THE OFFICE OF THE ACTUARY**

The people hired for the office of the actuary should have the background and skill set which would be required in the US or Western Europe. These individuals should have the ability to pass actuarial exams and the analytic ability to do the required work. Consequently, we suggest the following minimum requirements for all candidates:

- Degree in Mathematics or Finance from a recognized university in Armenia or elsewhere.
- Thorough knowledge and background in mathematical analysis (differential calculus, integral calculus, etc.), theory of probability and mathematical statistics.
- Computer oriented – the person should be comfortable using word processing, spreadsheet, and database programs. In particular, strong knowledge of Excel is required.
- Computer programming experience in Visual Basic, Visual Foxpro, Visual C++, or other similar programming language.
- English language ability (for at least one of the actuarial candidates).
- Discipline to pass an extensive examination program over a period of years to become a fully credentialed actuary in accordance with recognized international standards.
- Desire to be a pioneer in a new Armenian profession.
- Also helpful, but not mandatory, would be a background in economics, finance, pensions or other social sciences and practical experience in the Ministry of Social Security, Social Insurance Fund, Ministry of Finance, or Ministry of the Economy.