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TREASURY
THE WORLD BANK

Pension Asset Advisory Services (PAAS)

Aide Memoire

National Pension Service (NPS), Korea
May 22-24, 2006

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World Bank Treasury

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I. OVERVIEW

1. At the request of the Ministry of Health & Welfare (MoHW), Government of Korea, and Korea's National Pension Service (NPS), the World Bank Treasury (Treasury) sent a team of specialists to undertake a peer review of NPS' investment operations from May 22-24, 2006. MoHW and NPS have expressed interest in the technical advisory services (the 'TA Program') and asset management services offered by Treasury to official sector pension funds, which are aimed at helping to strengthen the investment management framework and operations of these institutions by sharing the experience and institutional knowledge accumulated by Treasury in managing a broad spectrum of assets in global markets over the past 50 years. The team was led by Sudhir Rajkumar, Head, Pension Advisory Management, and comprised Thumpasery J. George, Principal Investment Officer, Equity Portfolio Management; Masaki Tsumagari, Senior Investment Officer, Risk Monitoring; Joachim Coche, Senior Investment Officer, Asset Allocation; and Giovanni Mascarenhas, Manager (IT Applications). This Aide Memoire presents a summary of the key observations and recommendations arising out of the mission. The team would like to thank the staff of MoHW and NPS for their hospitality and for providing a collegial working environment during the visit.

2. NPS was established in 1988 as a partially funded defined benefit scheme, with a payment guarantee from the Government of Korea. It provides for mandatory coverage for virtually all employees and self-employed citizens of Korea. It is a social security scheme jointly supported by employees, employers and government. Current benefit and contribution rates are both subject to possible adjustments in the future. Its objectives are to provide for such payments as old age pension, survivors' pension, disability pension, lump-sum payments, and others. As of end-2004, over 17.07 million insured persons were covered by NPS, having steadily increased from around 4.4 million in 1988, as coverage was expanded.

3. As of December 31, 2005, the total investment portfolio of NPS had a market value of Korean Won (KRW) 163.9 trillion (or about USD 162.6 billion). This is expected to increase to over USD 200 billion equivalent by end-2006, and continue to rise quite rapidly for the foreseeable future. NPS is already one of the five largest pension funds in the world, and is expected to become the third largest within the next several years. Over 90% of this investment portfolio is managed in-house by NPS, with the balance 10% outsourced through about 80 external manager mandates (of which 70 are domestic). NPS currently uses 35 out of the 100 or so investment management firms in Korea. About 80% of the NPS portfolio is invested in domestic fixed income assets, with

a majority in domestic government and quasi-government securities and the rest in financial institution and corporate securities. NPS' holdings comprise 16% of the domestic fixed income market, and 28% (as of June, 2006) of the domestic government bond market. About 12% of the NPS portfolio is invested in domestic equities, which currently constitutes 3% of the domestic equity market. International investments, mostly in investment grade fixed income, but including small amounts in global equities and alternative assets, account for about 8% of the portfolio. NPS started investing in alternative assets in 2002, and have built up a portfolio of about USD 800 million equivalent in 49 venture capital, private equity, real estate, infrastructure, and corporate restructuring funds (of which 45 are domestic). NPS' investments in many cases constitute more than 50% of the fund size. NPS expect to obtain approval this year to invest in hedge funds.

4. Over the years, NPS has managed its investments in a prudent but conservative manner. During the period 1988-2005, NPS has been successful in achieving a total rate of return in excess of inflation as well as the nominal GDP growth rate, thus preserving the real value of its funds. However, NPS faces the long-term challenge of a rapidly maturing demographic profile of its beneficiaries. NPS is also rapidly outgrowing the domestic markets, where it has traditionally invested most of its funds, but cannot continue to do so in the future without creating market distortions. These challenges, coupled with its expected growth to become one of the three largest pension funds in the world within the next few years, underline the importance of diversifying NPS' investments into new asset classes and new markets globally, and managing its investment operations in a manner that combines a focus on prudent risk management with an optimization of investment returns within those risk parameters. *The following recommendations should be viewed from the perspective of what would be required to successfully enable NPS to build the capacity, in a sustainable fashion over the medium-term, to manage their investment operations in domestic and international markets within such a risk-return framework by internalizing global best practices into the organization.*

II. EXECUTIVE SUMMARY OF RECOMMENDATIONS

5. ***Authorizing Environment and Governance Structure:*** The National Pension Act (Act), originally promulgated in 1986, and last amended in 2005, provides the authorizing environment for NPS operations. The existing governance structure of NPS is broadly similar to other public investment management entities, appears to have served NPS well till now, and provides a robust foundation for the future. However, unlike most other public investment funds, NPS is on course to become one of the largest pension funds in the world within the next few years. NPS can successfully invest this large fund within a prudent risk-return framework only through significant diversification into new asset classes and new markets globally, which creates its own unique governance challenges. There appears to be some scope for strengthening the governance structure by: establishing a more detailed sub-committee structure of the National Pension Fund Management Committee (Management Committee) similar to that found in other well-regarded pension funds of comparable size; ensuring that a larger number of policymakers at different levels have a specialist background in investments and finance; reinforcing this expertise through a program of continuing education on different aspects of the investment framework and global markets (the

World Bank's Treasury organizes several educational seminars each year which bring together policymakers charged with governance of investment funds with the objective of exchanging views on best practices worldwide); and ensuring that such policy makers have a sufficiently long tenure to provide meaningful benefit to NPS through their contributions. A greater delegation of decision-making authority to levels where such decisions can be made most effectively, together with enhanced controls, reporting, and accountability, to go hand-in-hand with such delegation, would be in line with prevailing global best practice.

6. ***Investment Policy and Strategic Asset Allocation (SAA):*** At present, NPS prepares a strategic asset allocation through an asset-only mean-variance optimization process covering four asset classes. The process is based on risk-return expectations over an investment horizon of five years. The annual asset allocation for the following year is then derived by linear interpolation between the optimized five-year allocation and NPS' current allocation. The Annual Plan, prepared and approved by the Management Committee, encapsulates this asset allocation, together with tactical deviation bands for each asset class, benchmarks, risk limits, excess return targets, and a broad outline of the basic principles and methods to be employed for managing these funds (active versus passive management; in-house versus external management). NPS has a Fund Management Guideline, and Fund Management Rules, which incorporate many of the features of an Investment Policy Statement (IPS). Some important elements of an IPS include a clear outline of the rationale for holding the investments, and specification of the relevant investment time horizon, the risk tolerance parameters and risk bearing capacity, the return objectives and the liquidity needs. Current best practice in the pension industry globally suggests the use of an asset-liability management (ALM) framework for arriving at the optimal SAA. The pros and cons of an ALM framework versus an asset-only framework could be revisited taking into account the specific situation and sensitivities of NPS. Additional work on the most appropriate investment horizon and risk tolerance parameters (such as 'funded ratio at risk', 'contributions at risk') for NPS would also be useful. More sophisticated approaches for modeling asset return distributions in a multi-period setting could be used. Increasing the number of asset classes considered in the SAA process, and in particular, systematically assessing the benefits from international diversification, including innovative ways to manage the resulting foreign exchange risks, could be other areas of endeavor likely to yield beneficial investment results. Finally, a more formal approach to allocating the overall risk tolerance – quantified as the overall risk budget -- of NPS to strategic (or 'absolute', or 'beta') risk and active (or 'alpha') risk could be considered.

7. ***In-house and External Investment Management:*** Two key elements of any investment management structure and investment process are the active versus passive management decision, and the in-house versus external management decision. Both of these decisions can vary significantly by asset class and market, as well as for different investment styles within an asset class or for sub-asset classes. Both are guided by the approved investment policy and the overall risk budget allocated for deviating from this investment policy (the 'active' or 'alpha' risk). Over the medium term, NPS could use a more formal, quantitatively oriented, approach to optimally allocate its overall risk budget and design its portfolio management strategy by asset class accordingly. There is scope for a significant strengthening of the capability to *continually* evaluate new asset classes and markets globally as potential investment opportunities. NPS already has over 80 external investment mandates, both domestic and international, in a range of asset classes. Given that this number is likely to increase substantially over time, it is cost-

effective to strengthen internal capacity to select and manage/monitor external managers in different asset classes and reduce the dependence on consultants. Innovative approaches to manager selection, wherein each manager is evaluated from the perspective of its impact on the overall portfolio instead of on a stand-alone basis, could also lead to a more efficient use of the allocated risk budget. It may also be worthwhile to explore the added value of strengthening capabilities for tactical asset allocation (TAA) as another avenue for active risk taking.

8. ***Financial Risk Management:*** NPS has a sophisticated risk management structure, which includes the preparation of a well-defined 'Risk Management Program' (RMP) as a live document governing the day-to-day investment operations. The Risk Management Committee (RMC), composed of the CEO and CIO of NPS and five external specialists, is charged with allocating and monitoring risk and taking corrective action as needed. While this structure is adequate for the range of asset classes which NPS invests in at present, it may need to be adapted as NPS moves into new asset classes, particularly the less-liquid alternative assets. Stress testing can be used as an additional risk management tool, particularly in the case of non-publicly traded asset classes such as real estate and private equity. The largely buy-and-hold nature of a majority of its investment portfolio, partly imposed on it due to considerations of the market impact of any sales, also exposes NPS to systemic risk[1] that is difficult to diversify except through an active portfolio management approach or through the use of a broader array of instruments and asset classes.

9. ***Performance and Fund Evaluation:*** The Fund Management Center (FMC) of NPS, headed by the CIO, calculates daily performance returns, for internal reporting purposes, for a number of asset classes by collecting data from different custodians. The Fund Evaluation Team (FET) of the National Pension Research Institute (NPRI) prepares an annual performance report each June for the previous calendar year and a semi-annual report each September for the first six months of the year. These reports use monthly performance data and are based on data prepared by NPS for their internal use, as mentioned above. While the quality of performance and fund evaluation appears to be adequate for the current range of asset classes, NPS may need to revisit the most suitable platform for day-to-day performance monitoring, and move to something more robust than the existing worksheet based system, as the overall complexity and breadth of its investments increases. NPS could also consider enhancing their performance attribution capabilities, as well as introducing trading performance measurement systems. Additionally, there is room to develop more appropriate benchmarks or further refine existing benchmarks in various asset classes. The Investment Strategy Team is currently working on ways to improve the domestic fixed income benchmark, and the results are expected to be applied to the 2007 Annual Plan. NPRI's FET has already done some good work in the area of domestic equities in this regard.

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[1] For buy-and-hold investors, the maximum return is the yield, and the maximum loss is represented by default. That is, the portfolio return distribution is asymmetric. To some extent, default risk is a non-systemic risk that can be diminished via diversification. Correlation among issuers, however, makes it impossible to entirely eliminate default risk through diversification. In Korea, the common dependence of all issuers on general economic conditions and the common exposures of all issuers within a given industry give default risk a systemic component that cannot be diversified away. The active total return manager is in a better position to manage systemic risk. The manager should be able to monitor both systemic and non-systemic risk over a certain investment horizon based on the security-level composition of the investment portfolio and its benchmark. The asymmetric nature of the risk-return profile could also be addressed through the asset allocation process.

10. ***Investment Workflow and Operational Risk:*** An elaborate process for trade approval involving four signatures and going up to the level of CIO, could conceivably be made more efficient, in line with current best practice which encourages delegation of trade authority to the portfolio manager within a well enforced compliance and operational framework. The absence of a front office trade capture system forces portfolio managers to enter transactions directly into the back office system (SAP) which usually requires additional settlement/accounting information. While the overall information and physical security aspect of NPS' investment operations appears to be adequate, some exceptions were noted. The Disaster Recovery plan of NPS does not cover the replication of all asset management applications, which could leave it exposed in the areas of asset allocation, risk management and performance measurement. The business continuity site is only 30 minutes away within the same city, and could be similarly affected as the main site in an adverse situation. The setting up of custodian agreements and operational guidelines is being performed by staff in the risk management team; typically the settlements team is charged with this responsibility. Strengthening of the legal expertise and support needed by staff for establishing these custodial relationships would also be beneficial. A general strengthening and expansion of middle office capabilities to include staff dedicated to capturing market data, performance measurement activities, and reconciliation of custodian reports, would be useful.

11. ***Information Technology (IT) Infrastructure:*** NPS has a central Information System department which provides overall infrastructure, network, and desktop support, focusing primarily on the collection and payment activities. Separately, the FMC has four dedicated IT staff who are currently part of the risk management team. FMC should consider setting up an independent IT team by expanding this current group of four IT staff and tasking them with all asset management related IT functions including technical development, business analysis, project management, and liaison with software vendors. While NPS has renewed its IT systems in 2003, introducing packages to support asset allocation, risk management, back office, and performance evaluation functions, additional work on integration and plugging gaps in the information transfer between applications could be usefully done. There may also be some value in expanding access to the analytical capabilities and market information provided by Bloomberg terminals (of which six are currently available) for all portfolio managers, especially as NPS expands the number of asset classes and markets in which it invests. Finally, expanding access to the official domain-based email system for all NPS asset management staff, and increasing the storage allocation and archival capabilities of this system, will improve the efficiency, transparency, reliability, and security/confidentiality of NPS' global asset management activities that could be increasingly facilitated using this system.

12. ***Human Resources and Training:*** NPS employs a total of over 5000 staff, of which 89 are in the FMC. Some 60 of these 89 staff are investment professionals, who are employed on 3-year contracts which have a performance-based remuneration component, and which may be renewed if their performance is judged to be acceptable. Performance-based compensation which is competitive with the market contributes to NPS' ability to attract and retain qualified staff. NPS will necessarily transition, over the medium-term, to investing in a broader array of asset classes and geographical markets, and will consequently move away from a largely buy-and-hold investment strategy to a more actively managed, portfolio-based investment approach. This will require NPS staff

to be trained in advanced analytical and quantitative techniques, and in the ability to invest in new asset classes, either through internal or external portfolio managers. Developing a core competence in selecting and effectively monitoring a portfolio of external managers in a wide range of asset classes and markets, including alternative assets, is likely to become a key factor in NPS' future investment performance. This training should also enable NPS staff to provide technical support to decisions that will need to be made by the Management Committee and other governing bodies on investment policy, benchmarks, risk budgets and allocation, and investment guidelines. The World Bank Treasury's technical advisory services could assist in providing the requisite training to staff through both on-site, customized workshops at NPS headquarters; its standard set of specialized annual workshops on front, middle, and back-office aspects of the investment framework, provided for all its clients; as well as helping to link up NPS with other appropriate sources of training.

III. DETAILED OBSERVATIONS AND DISCUSSION OF RECOMMENDATIONS

A. Authorizing Environment and Governance Structure

13. *Observations:* The National Pension Act, originally promulgated in 1986, and amended most recently in 2005, provides the authorizing environment for NPS. The 21-member Management Committee, comprising representatives of government, employers, employees, individually insured persons, as well as two experts in the field of pensions, and chaired by the Minister of Health & Welfare is the governing body. The Management Committee is the final decision making body for NPS. It reviews and approves the fund management guidelines, strategic asset allocation, annual plan, income and expenses of the fund, and other important issues. It meets at least once every quarter (more than four times a year). It is supported in its work by a sub-committee, the National Pension Fund Evaluation Committee (Evaluation Committee), which is chaired by the Vice-Minister of Health & Welfare, and consists of 12 of the Management Committee's members. The Evaluation Committee approves the agenda for the Management Committee's meetings, and provides specialized and technical input to the Management Committee on the fund's composition by broad asset class, accounting issues, performance evaluation, overall management structure, etc. The National Pension Division in MoHW comprises three teams focusing on pension policy, pension finance, and pension payments. The pension finance team focuses on estimates of long-term cash-flows (liabilities and assets) of NPS, and also provides day-to-day support to the deliberations of the Management Committee.

14. A three-tiered governance structure is in place for the investment management activity, and comprises of the following elements:

- a Management Committee which meets at least once every quarter, and has the ultimate responsibility for NPS' investment management activities, including approval of fund management guidelines, strategic asset allocation, annual plan, etc. -- it is provided specialized and technical input in this task by the Evaluation Committee, and day-to-day support by the pension finance team in MoHW;
- a Risk Management Committee (RMC) chaired by the CEO of NPS, and comprising the CIO and five outside experts, which meets quarterly -- or more

frequently (if so requested by at least three members) -- and reviews and approves risk management policies, risk limits, as well as the risk management of new investment instruments and asset classes; and

- an Investment Committee (IC) within the organizational structure of the Fund Management Center (FMC) of NPS, chaired by the CIO and comprising all FMC team leaders, which meets weekly and reviews/approves monthly fund management plans in line with the Annual Plan, investment transactions, performance evaluation of internal and external managers, and selection of external managers.

15. This governance structure is broadly similar to the three-tiered structure commonly found in other public investment management entities: (i) a high level Board that typically has the responsibility for deciding on the overall investment objectives, establishing the institutional risk tolerance, and formulating investment policy; (ii) an Investment Committee that has the responsibility for translating the investment policy to an implementable benchmark portfolio, laying down detailed investment guidelines, allocating the overall risk budget, and overseeing the investment management operations; and (iii) an operating level Investment Department that has actual day-to-day responsibilities for in-house portfolio management and/or management of external managers.

16. *Recommendations:* NPS faces a unique governance challenge, arising from the fact that it is on course to become one of the largest pension funds in the world within the next few years, and can successfully invest this large fund within a prudent risk-return framework only through significant diversification into new asset classes and new markets globally. It is recommended that NPS explore the potential for strengthening the existing governance structure by:

- establishing a more detailed sub-committee structure of the Management Committee similar to that found in other well-regarded pension funds of comparable size;
- ensuring that a larger number of policymakers at different levels have a specialist background in investments and finance;
- reinforcing this expertise through a program of continuing education on different aspects of the investment framework and global markets; and
- ensuring that such policy makers have a sufficiently long tenure to provide meaningful benefit to NPS through their contributions.

17. It may be useful to formalize a two-tier authorization framework, comprising a formal Investment Policy Statement (IPS) which would be approved by the Management Committee, and detailed investment guidelines and risk limits which would be approved by a more operationally oriented committee with a preponderance of investment experts as members, based on authority delegated by the Management Committee. The IPS should reflect the institutional risk tolerance using an appropriately defined investment horizon and risk tolerance parameters. This risk tolerance could be defined in the context of liabilities (e.g. 'funded ratio at risk', 'contributions at risk'); or in an asset-only context, e.g. level of income volatility or market value volatility of the investment portfolio over a predetermined investment horizon, and/or credit, liquidity, and interest rate risk. The Investment Guidelines would be a more operational, flexible document, which would

translate the broad principles, strategic asset allocation (SAA), and risk budget embodied in the Investment Policy into specific benchmarks and risk limits.

18. A clearer separation of roles and accountabilities at each level would also be useful. A critical step in this process is a decentralization of the decision making process, with delegation of decision-making authority to levels where such decisions can be most effectively made. This greater delegation can, of course, only materialize together with enhanced controls, reporting, and accountability, in line with prevailing global best practice.

B. Investment Policy and Strategic Asset Allocation (SAA)

19. *Observations*: NPS has a well developed framework for reviewing asset allocation decisions annually, which is led by the Fund Policy Team in NPRI. As a first step, an Annual Plan, approved by the Management Committee, establishes weights and deviation bands around these weights for each asset class. In the second step, the FMC determines actual targeted asset allocation on a monthly basis within the bands set out by the Annual Plan. Changes to asset class weights and deviation bands in the previous Annual Plan are proposed by MoHW representatives to the Management Committee, based on analysis carried out by the Fund Policy Team at the NPRI, in co-operation with the Investment Strategy Team at the FMC. Subsequently, the Annual Plan is deliberated on and settled by the National Assembly.

20. The asset allocation for the Annual Plan is derived through an asset-only mean-variance optimization process covering four asset classes, based on risk-return expectations over an investment horizon of five years. The annual asset allocation for the following year is then derived by means of linear interpolation between the optimized five-year allocation and NPS' current allocation. The four asset classes considered for this optimization exercise are: domestic fixed income, domestic equity, international fixed income, and international equity. The allocation to private equity (domestic and international) as the fifth asset class is determined outside the optimization exercise based on quantitative and qualitative criteria.

21. Risk and return expectations over the investment horizon of 5 years are required as input for the optimization and are obtained from a number of different sources. Return expectations for international fixed income are based on yield forecasts obtained from Global Insight, Inc. For domestic fixed income, yield projections comprise the expected yield on government bonds and an expected credit spread, which takes the expected composition of domestic fixed income holdings into account. Return expectations for global equities use estimates from Wilshire Associates. For domestic equity, the expected return corresponds to the expected risk free rate plus an equity risk premium. The assumption on the equity risk premium is the result of a consultancy project with external academics. Risks are calculated using covariance estimations based on monthly data going back 5 years. In addition to the risk-return expectations, the Annual Plan comprises macro-economic projections, which are obtained from the Korea Development Institute. While there is no immediate link between the macro variables and the assumed return scenarios, the macro projections feed into the calculation of the fund's target return.

22. Out of the set of mean-variance efficient allocations, a range of possible asset allocations is isolated which are discussed at the Management Committee. This

selection is made taking the fund's target return as well as various risk measures into account. The target return corresponds to the projected growth in nominal GDP plus an add-on aimed at mitigating potential increases in future contribution rates. In addition to nominal GDP growth, expected portfolio returns are compared to projected inflation rates. Risks are measured using portfolio volatility and shortfall probabilities. As the portfolio optimization is based on five-year return expectations, the annual asset allocations are derived by linear interpolation between the optimized five-year allocations and the fund's current allocation[2]. In a second step, the actual asset allocation to be targeted over any given year is established by the IC within the deviation bands set-out in the previously approved Annual Plan, in December of each year. In addition, the IC decides on monthly allocations relative to the annual asset allocation.

23. *Recommendations:* NPS has a Fund Management Guideline, and Fund Management Rules, which incorporate many of the features of an IPS. Some important elements of an IPS include a clear outline of the rationale for holding the investments, and specification of the relevant investment time horizon, the risk tolerance parameters and risk bearing capacity, the return objectives and the liquidity needs. The SAA is then derived directly from these objectives and constraints expressed in the IPS. *Understanding and expressing an institution's risk tolerance and risk bearing capacity are the most critical and sometimes the most challenging elements in arriving at the SAA.* While the investment horizon for many conservative portfolios tends to be 12 months given the prevalence of annual reporting cycles, the choice of investment horizon should ideally be a function of the nature and type of the fund, the projected liquidity needs and likely drawdown profiles that determine the relative permanence of the invested funds, and the institutional capacity to bear volatility in portfolio returns and/or market value over various reporting cycles in exchange for expected additional returns over a longer time horizon. In specifying these parameters, risk return trade-offs over a longer time horizon may correspond more closely to when the funds are actually required. There is room for additional work on the most appropriate investment horizon and risk tolerance parameters for NPS.

24. Current best practice in the pension industry globally suggests the use of an ALM framework for arriving at the optimal SAA. The pros and cons of an ALM framework versus an asset-only framework could be revisited taking into account the specific situation and sensitivities of NPS. For example, in addition to the current mean-variance criterion, alternative asset allocations could be discussed with regard to the implications for the expected funded ratio, funded ratio at risk, expected contributions and/or contributions at risk over various horizons as well as the long-term sustainability of the benefits. Irrespective of the asset-only versus ALM framework issue, a more formal approach to allocating the overall risk tolerance – quantified as the overall risk budget – of NPS to strategic (or 'absolute' or 'beta') risk and active (or 'relative' or 'alpha') risk could be considered. That is, the SAA and the active risk budget could be determined simultaneously taking into account institutional risk preferences as well as expectations about the added value of active management and the risk/return characteristics of

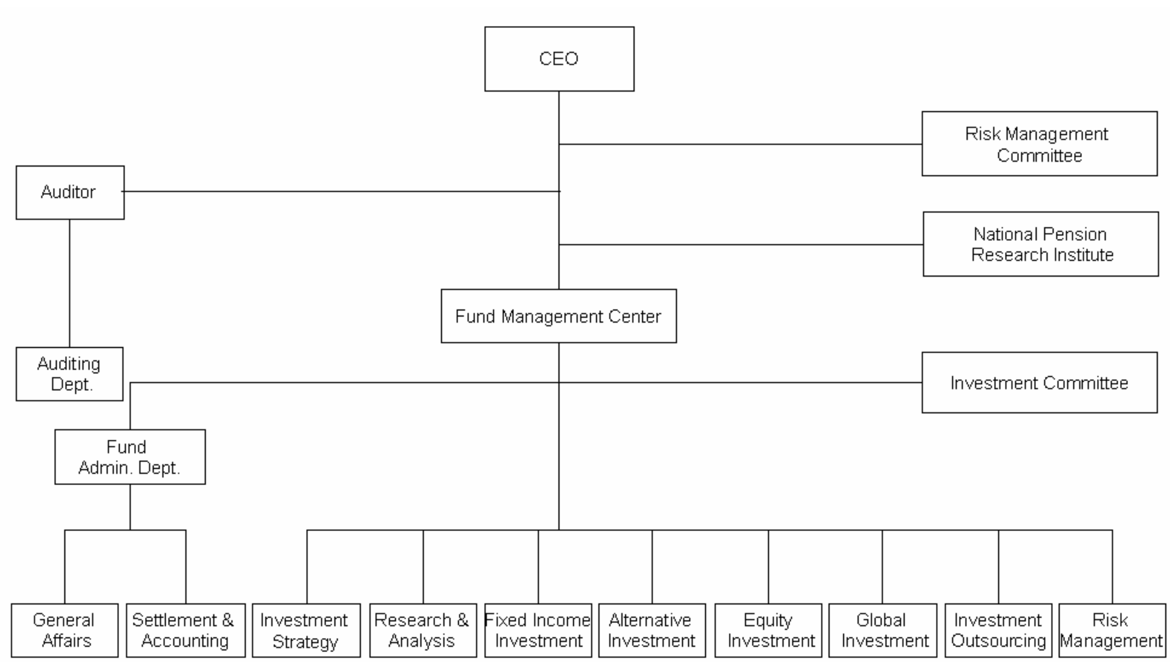
[2] NPS currently does not apply an ALM framework to its SAA. The asset-only approach for the portfolio optimization is based on the criterion of maximizing expected return (funded ratio) subject to avoiding short falls of the funded ratio below 80% of the expected funded ratio at a confidence level of 95%. The funded ratio and shortfall risk are not based on an analysis of liabilities. NPS recognizes the need for analysis of its liabilities, and plans to introduce the same after a thorough evaluation of appropriate methods and software tools that may be available for this purpose.

various individual asset classes. A precondition for this approach would be a further discussion on how to appropriately define and quantify institutional risk tolerance parameters. Treasury has experience in codifying appropriate institutional risk tolerance parameters and in integrating strategic and active risk decisions.

25. Increasing the number of asset classes considered in the SAA process, and in particular, systematically assessing the benefits from international diversification, including innovative ways to manage the resulting foreign exchange risks, could be other areas of endeavor likely to yield beneficial results. NPS increasingly faces constraints in investing in domestic markets, and there is concern that any required disinvestment in the future could have a significant distorting impact on domestic financial markets. Coupled with an increase in the number of asset classes, more sophisticated approaches for modeling asset return distributions in a multi-period setting could be used. Improvements could also be sought in making the optimization results more robust.

C. <u>In-house and External Investment Management</u>

26. *Observations:* The investment management activities, both in-house and through external managers, are carried out by seven teams in the FMC. Each team is led by a team leader, who reports to the CIO, who is the Director of the FMC. An organizational chart is given below:



27. <u>Investment Strategy Team</u>: This team, which consists of 8 staff (of which 5 are CFAs), has a broad range of responsibilities. It works together with the Fund Policy Team of NPRI to assist MoHW in the preparation of the Annual Plan, and provides other support in the preparation of materials/reports to the National Assembly and for public dissemination. It also provides support to the IC on monthly asset allocation decisions in accordance with the Annual Plan, and in TAA activities. It tracks markets for each asset

class. Other functions include research on governance and SAA practices of major pension funds in developed countries, and helping to set objectives for other teams and assist with human resource issues in the FMC. Beginning in 2006, the team is also responsible for rebalancing of portfolios.

28. Research & Analysis Team: This team has 9 staff, mostly with a background in sell-side equity analysis, but including one fixed income credit analyst. They plan to hire more staff. The team runs a model domestic equity portfolio, which has been in existence for three years. The Model Portfolio (MP) has generated an alpha of around 100 basis points (bps) versus the benchmark of KOSPI200 TR (total return, including dividends) index, although it underperformed last year. Sector analysts in the team overweight or underweight individual stocks versus the benchmark in their respective sectors, using earnings and valuation models developed by them; they can also invest in stocks outside the index. Annual turnover in MP is less than 20%. Risk management is done by controlling sector and market cap weights. The MP has a tracking error (TE) limit of 350 bps and a target Information Ratio (IR) of 0.7. The team uses a system purchased from APT to calculate ex-ante TE.

29. Equity Investment Team: This team has 7 staff, and managed about KRW 10.3 trillion (as of end-2005) in three domestic equity funds. An MP Follow Fund (KRW 6.2 trillion), that is required to track the Model Portfolio, is managed by 3 staff including the team head, picking 80% of their stocks from it. The MP Follow Fund (permitted TE: 410 bps) outperformed the MP last year. An Active Fund (KRW 1 trillion), where the investable universe (based on financial statements, liquidity criteria, etc. – currently comprising 139 stocks from KOSPI200 index) is provided by the research & analysis team, is managed by one staff (permitted TE: 450 bps). Two staff manage a Pure Index Fund (KRW 2.6 trillion) which tracks the KOSPI200 index, and an Enhanced Index Fund (KRW 0.5 trillion) which can move between cash, stocks, and futures. The two index funds have permitted TE of 120 bps and 210 bps respectively. Actual TE in the case of all these funds has been significantly lower. The team includes two traders who execute all transactions for the different funds. The team is planning to invest in principal protected, equity-linked funds, and absolute return funds.

30. Fixed Income Investment Team: This team is responsible for the in-house management of the domestic fixed income portfolio. It has 8 staff. The team generally follows a buy-and-hold strategy (but does sell overpriced bonds, on occasion) due to concerns about the market impact of selling securities, and because of significant net cash inflows which have to be invested. NPS holdings currently constitute 16% of the domestic bond market, and 30% of the government bond market. The team does credit, yield curve, and sector analysis, and have internally developed a relative value model. They usually buy through primary dealers and take about 30% of government bonds offered in any auction. They have a custom benchmark, which is rebalanced every quarter, with a target duration based on intermediate targets during the year that tie in with the Annual Plan target duration, and sector weights that follow actual investment decisions. The Investment Strategy Team is currently working on ways to improve the benchmark, and the results are expected to be applied to the 2007 Annual Plan.

31. Alternative Investment Team: NPS started investing in domestic alternative assets in 2002, and currently have actual investments of USD 750 million equivalent, and commitments in the region of USD 3 billion. Their aim is to increase actual investments to USD 10-11 billion within five years (i.e. by 2011); this will require a

commitment amount that is much higher. The team has two staff each focusing on infrastructure, real estate, and private equity. They plan to add another two staff before end-2006, and to increase the team to around 20 staff by 2011. Their current private equity investments of USD 530 million are comprised of USD 220 million in venture capital (36 funds, 20 general partners), USD 150 million in corporate restructuring funds (7 funds, 5 general partners), and USD 160 million in private equity funds (2 funds, 2 general partners). The total market for private equity in Korea is currently estimated at USD 3 billion. Their real estate investments of USD 180 million focus on prime office buildings, which are viewed as more stable. The commercial real estate market in Korea is currently estimated at USD 3 billion, although it is difficult to estimate accurately. Their infrastructure investments (currently USD 40 million, versus a total market of USD 2 billion) are guaranteed by the government. NPS does not like to invest with foreign private equity funds in Korea, whose sponsors, in their view, generally have a bad reputation. They also believe that the fee levels with Korean general partners are lower than with foreign general partners. NPS' investments in many cases constitute more than 50% of the fund size. They use the volatility and correlation figures for 3-year BBB-debt as a proxy to analyze private equity risk.

32. Investment Outsourcing Team: This team is responsible for the selection and management of external managers for domestic fixed income and domestic equity. It has 8 staff, and expects to increase this number soon. The selection and management of external managers for international assets has been made part of the Global Investment Team's responsibilities since January, 2006. NPS has employed external managers for about 5 years now. Most externally managed domestic equity is actively managed, but the proportion has been decreasing (from 84% in 2005 to a target of 75% at end-2006). Active external mandates include core, small and mid-cap stocks, corporate governance strategies, etc. Externally managed fixed income, which is all high quality, investment grade, focuses on active trading and credit-oriented strategies. Domestic fixed income assets were given to external managers for the first time only about a year and a half ago. The investment guidelines are relatively conservative, and stop loss provisions – calculated quarterly for equity mandates and semi-annually for bond mandates – are in place. Funds have been withdrawn from some equity managers because stop loss limits were hit.

33. There are about 100 asset management companies in Korea and NPS is currently using 35 of these firms. There are 3 fund rating companies in Korea: JEROIN and Morning Star for equities, and KFR for fixed income. These fund rating companies provide a monthly report analyzing fund managers, which is used as part of the manager monitoring exercise. In the selection of external managers, the following steps are used, in conjunction with a consultant:

- Prepare a long list of firms to be sent a Request for Proposal (RFP) based on recommendations from fund rating companies
- Short list firms based on an evaluation of responses received to the RFP, covering their performance, organization, etc.
- Conduct due diligence
- Invite short-listed firms for presentations before a committee consisting of 4 external members and 4 internal members
- Examination of correlation and fit with internal portfolios and other asset classes is done by the investment strategy team

34. Global Investment Team: This team is responsible for all investing in foreign assets, both in-house as well as through external managers. It has 9 staff at present, and expects to more than double in size within a year. Its internal management currently consists of a buy-and-hold portfolio of US Treasuries, mostly in the 5-year sector, but now beginning to extend to the 10-year sector. The size of current holdings is about KRW 14.5 trillion, having increased significantly from KRW 3 trillion as recently as 2004. The currency exposure on these holdings is hedged through off-market swaps up to the maturity of these bonds with the Bank of Korea (BOK), with USD cash-flows from these holdings being exchanged with BOK for KRW cash-flows corresponding to the return on equivalent maturity Korean government bonds. This effectively enables NPS to invest additional funds in the Korean government bond market without further impacting it, given that their holdings already constitute 30% of this market. They would like to do more such swaps with BOK, but do not know if this is possible. The team has plans to invest in structured bonds, such as AA/AAA collateralized debt obligations (CDOs), and possibly in inflation-indexed bonds. They do not currently feel confident about their in-house capacity to invest in instruments with embedded optionality, such as mortgage-backed securities (MBS).

35. The team started employing external investment managers in global fixed income and global equity about three years ago. It currently has 5 active fixed income managers (4 benchmarked to the Lehman Global Aggregate index – hedged into USD, and one to the Lehman US Aggregate index). It also has one passive, and three each of active core and active satellite – which have a higher TE -- managers in the global equity asset class, with an additional five in the process of being added. The team uses two consulting firms to develop a list of managers requested to respond to an RFP. The overall selection process is similar to that used for domestic managers. The issue of portfolio fit is mainly addressed through qualitative measures, although mean-variance optimization is also used. They have also committed about USD 355 million to four private equity funds, and USD 50 million to a real estate fund. They have used a consulting firm's input on a case by case basis for these commitments. Currency exposure is a sensitive issue, and so far, all international fixed income and equity investments have been fully hedged into KRW through rolling 6-month forward contracts. They would like to use currency as an overlay product.

36. Trade Execution: On average, about 20 trade tickets are written per day. There is a list of eligible brokers; for equities, there are 20 for internal trading, and 27 approved for use by external managers. There are 15 approved primary dealers for fixed income, as well as a list of dealers for secondary market trades in corporate bonds, structured bonds, and government agency bonds. The brokers are given one of 4 possible ratings, which determine the amount of business given to them. There is a limit of KRW 10 billion per broker per day in terms of transaction value.

37. *Recommendations:* Two key elements of any investment management structure and process are the active versus passive management decision, and the internal versus external management decision. Both of these decisions can vary significantly by asset class and market, as well as for different investment styles within an asset class or for sub-asset classes. Decisions on passive versus active management are driven by an allocation process of the approved active risk budget which takes into account the likelihood of achieving superior returns through active management. This likelihood can vary significantly by asset class and market. Similarly, decisions on internal versus external management of the investment portfolio are driven by the availability and

relative cost of each option, which can again vary significantly by asset class and market. Over the medium term, NPS could use a more formal, quantitatively oriented, approach to optimally allocate its overall risk budget across asset classes and markets, and design its portfolio management strategy accordingly.

38. NPS is keenly aware of the need to substantially increase its international investments from the current 8% of the portfolio in view of domestic market capacity constraints; in fact, the CIO has spoken of his desire to target an international investments share of 50% of the portfolio over the medium term. A thorough evaluation of the different options available to achieve this target, viz. i) selecting an ever-increasing number of external managers; ii) setting up a joint venture with another investment firm; and iii) establishing an independent overseas company, will be needed in order to arrive at the most feasible solution, which may consist of more than one of these options. Concurrently, NPS should aim for a significant strengthening of the capability to *continually* evaluate new asset classes and markets globally as potential investment opportunities, including non-traditional asset classes, and the ability to incorporate them in their quantitative SAA process.

39**.** NPS already has over 80 external investment mandates, both domestic and international, in a range of asset classes. Given that this number is likely to increase substantially over time, it is cost-effective to strengthen internal capacity to select and manage/monitor external managers in different asset classes and reduce the dependence on consultants. Innovative approaches to manager selection, wherein each manager is evaluated from the perspective of its impact on the overall portfolio instead of on a stand-alone basis, could also lead to a more efficient use of the allocated risk budget.

40. It may also be worthwhile to explore the added value of strengthening capabilities for tactical asset allocation (TAA) as another avenue for active risk taking. TAA activities can increase the overall efficiency of use of the available risk budget, since they can be designed as an effective diversification away from the traditional avenues for active risk taking by internal and external portfolio managers.

D. Financial Risk Management

41. *Observations:* NPS prepares a well-defined ‘Risk Management Program’ (RMP) as a live document which governs their day-to-day investment operations. According to this RMP, risk tolerance is determined in the form of ‘The Size of Risk Asset’ in the Annual Plan decided by the Management Committee. The RMC then decides the risk budget for each asset class. The external members of RMC include experts from a credit rating agency, risk manager at a commercial bank, compliance officer at a custodian, and academia. A separate risk management team, comprising 11 staff (4 of whom are responsible for financial applications) in the FMC oversees the production of all risk reports.

42. Implementation of investments is guided by risk limits expressed as Market VaR (value at risk) and/or Credit VaR for different asset classes. NPS monitors risk based on 6 broad risk categories which seem compliant with BIS categorization, which are; (1) Credit Risk, (2) Active Risk, (3) Market Risk, (4) Currency Risk, (5) Operational Risk, and (6) Other Investment Risk, which covers concentration of holdings, and new type of investments. For credit risk and market risk, NPS uses Credit Manager and Risk

Manager respectively, both of which are products of RiskMetrics. Each category is clearly defined in terms of the specific risk methodologies to be used for different asset classes, the tools to be used, and the frequency of monitoring. The responsibility/authority matrix is also prepared, with necessary actions in case of a breach in risk limits and loss cut (stop loss) being clearly defined in the RMP. The risk budget is calculated based on the assumptions used for the Annual Plan, i.e., total TE is coming from estimated total IR and target alpha, then each asset class TE is calculated based on the same set of assumptions.

43. *Recommendations:* NPS has a sophisticated risk management structure, which is adequate for the range of asset classes in which it invests at present. This structure may need to be adapted as NPS moves into new asset classes, particularly the less-liquid alternative assets, as well as global markets, which may introduce lags in data availability. Stress testing can be used as an additional risk management tool, particularly in the case of non-publicly traded asset classes such as real estate and private equity. Good multi-scenario financial projections and business plans can also serve the same risk management purpose for such asset classes by being used for stress testing. Stress test scenarios must be chosen so they test 'conventional wisdom' and focus on risks relevant to the positions taken in the NPS portfolio. A key to the success of stress testing is continuous review and updating of the stress scenarios. This is a dynamic process that is responsive to changes in positions and economic events, and looks to prior stress tests to identify areas where scenario refinements can be made. The largely buy-and-hold nature of a majority of NPS' investment portfolio, partly imposed on it due to considerations of the market impact of any sales, also exposes it to systemic risk that is difficult to diversify except through an active portfolio management approach or through the use of a broader array of instruments and asset classes.

E. <u>Performance and Fund Evaluation</u>

44. *Observations:* The FMC of NPS, headed by the CIO, calculates daily performance returns, for internal reporting purposes, for a number of asset classes by collecting data from different custodians. NPS follows a national Korean accounting standard, which is similar to international accounting standards. Portfolios are grouped under industry standard accounting books – trading, held to maturity and available for sale. All fixed income and equity securities are marked to market daily. Alternative investments are priced monthly and venture capital investments are valued annually. Currency gain and loss is booked monthly. The Fund Evaluation Team of NPRI prepares an annual performance report each June for the previous calendar year and a semi-annual report each September for the first six months of the year. These reports use monthly performance data and are based on data prepared by NPS for their internal use, as mentioned above. The Fund Evaluation Team also determines the size of performance-based compensation for NPS as whole, which NPS management is then authorized to allocate to individual staff.

45. *Recommendations:* While the quality of performance and fund evaluation appears to be adequate for the current range of asset classes, NPS may need to revisit the most suitable platform for day-to-day performance monitoring, and move to something more robust than the existing worksheet based system, as the overall complexity and breadth of its investments increases. NPS could also consider enhancing their performance attribution capabilities, as well as introducing trading performance measurement systems. Additionally, there is room to develop more appropriate

benchmarks or further refine existing benchmarks in various asset classes. The Investment Strategy Team is currently working on ways to improve the domestic fixed income benchmark, and the results are expected to be applied to the 2007 Annual Plan. NPRI's FET has already done some good work in the area of domestic equities in this regard.

F. Investment Workflow and Operational Risk

46. *Observations:* All trades are transacted directly with external brokers over recorded telephone lines. They are then entered by the portfolio managers directly into the back office system (SAP). The absence of a front office trade capture system to record transactions and to provide related analytics was noted. Back office systems usually require additional settlement/accounting information which typically does not fall within the responsibility of investment managers. Two levels of confirmation are performed: the first for compliance purposes and the second pertaining to the verification of trade details with the custodian and settlement bank. The broker sends a copy of the transaction details to (i) the settlement team, (ii) portfolio manager, (iii) custodian, and (iv) the counterparty.

47. Internal approval for the trade involves a series of signatures on the confirmation ticket from the (i) portfolio manager, (ii) assistant team head, (iii) team head, and (iv) the CIO. This elaborate process is not in line with current best practice which encourages delegation of trade authority to the portfolio manager within a well enforced compliance and operational framework. Upon receipt of these signatures, the confirmation document is provided (in person) to one of the settlement banks (KEB and Standard Chartered SCFB) which are located in the same building.

48. The back office appears to be adequately staffed with 3 accounting professionals and 4 settlement staff. Reconciliation of custodian reports is performed by the front office investment teams. This function is more typically performed by a middle/back office team in most organizations. The risk management team receives and collates all custodian data relating to exposure and performance.

49. The back office system, SAP, is primarily used to generate accounting reports and to print the confirmation of each trade. The general ledger is held within SAP. The accounting ledgers and process are audited annually by a firm appointed by MoHW. SAP does not generate any SWIFT messages – the entire settlement function, after confirmation, is outsourced to the settlement banks. In general, the back office users do not have any major issues with SAP, although they have noticed that some on-line commands are cryptic and expressed that they would benefit from additional training in this area. The back office staff feels that most of the reports generated from SAP are tailored to provide management level information, rather than to support daily transaction processing. A host of additional accounting reports are prepared manually – for tasks such as change of accounts, etc.

50. NPS is subject to a national disclosure standard for transparency in financial reporting, similar to Sarbanes-Oxley. The risk management team works closely with the Auditing Department on compliance with this requirement, as well as on annual audits conducted by external agencies.

51. The initial setting up of custodian agreements and subsequent operational guidelines are being performed by the risk management team. The custodians are Korean Exchange Bank (KEB), Kookmin Bank (KB) and Hana Bank on the domestic side, and State Street Bank (SSB) and Korea Securities Depository (KSD) for foreign investments. The fund management applications are separated from the rest of the institution by a local firewall. Overall NPS security policy governs all activities within the FMC. Physical security arrangements appear adequate. Clear roles for portfolio managers, accounting, risk management, etc., are defined and enforced for access to production applications. The information technology (IT) staff does not have privileges to alter production transaction information. An exception to this rule is that IT staff is responsible for capturing market data. This function should ideally be moved to the middle office.

52. NPS has a published Disaster Recovery plan which involves the replication of key institutional applications at a remote site. However, the only asset management applications included in this plan are SAP and the data warehouse, leaving the fund exposed in the areas of asset allocation, risk management and performance measurement. The business continuity site is within the same city, about 30 minutes away. In the event of an adverse situation affecting NPS' headquarters, there is a significant probability that the backup site would also be similarly affected.

53. *Recommendations:* An elaborate process for trade approval involving four signatures and going up to the level of CIO, could conceivably be made more efficient, in line with current best practice which encourages delegation of trade authority to the portfolio manager within a well enforced compliance and operational control framework. The absence of a front office trade capture system forces portfolio managers to enter transactions directly into the back office system (SAP) which usually requires additional settlement/accounting information. While the overall information and physical security aspect of NPS' investment operations appears to be adequate, some exceptions were noted. The Disaster Recovery plan of NPS does not cover the replication of all asset management applications, which could leave it exposed in the areas of asset allocation, risk management and performance measurement. The business continuity site is only 30 minutes away within the same city, and could be similarly affected as the main site in an adverse situation. The setting up of custodian agreements and operational guidelines is being performed by staff in the risk management team; typically the settlements team is charged with this responsibility. Strengthening of the legal expertise and support needed by staff for establishing these custodial relationships would also be beneficial. A general strengthening and expansion of middle office capabilities to include staff dedicated to capturing market data, performance measurement activities, and reconciliation of custodian reports, would be useful.

G. <u>Information Technology (IT) Infrastructure</u>

54. *Observations:* A central Information System department provides infrastructure, network and desktop support for all of NPS, focusing primarily on the collection and payment activities. Separately, the FMC includes four IT staff who support applications specific to this department. These staff are part of the Risk Management Team. In 2003, NPS embarked on a systems renewal for their investment management activities. Details of the packages introduced, and a chart depicting the NPS investment systems, are provided below:

Asset Allocation

- Strategic: PALM (Ortec)
- Tactical: Domestic software

Risk Management

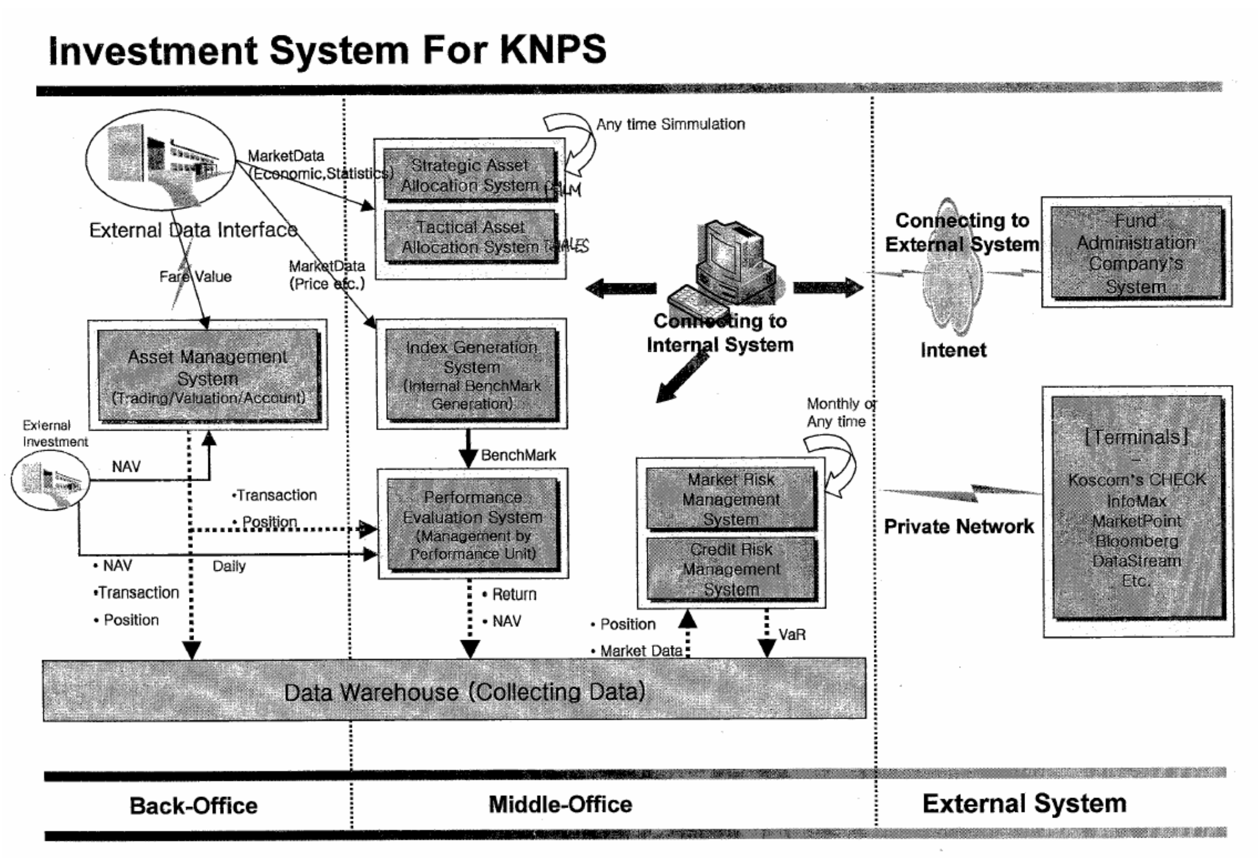
- Market Risk: RiskManager
- Credit Risk: CreditManager

Back Office

- Transaction/Valuation: CFM (SAP)
- Accounting: FI (SAP)

Performance Evaluation

- Performance Measurement: Domestic software
- Benchmark Indexing: Domestic software



55. The above applications are hosted on six Unix and four NT servers. The underlying databases are DB2, Oracle and MS SQL Server. There are presently six Bloomberg terminals in use, and the FMC is considering the introduction of Reuters to capture market data for global investments. Only a small percentage of NPS staff utilize their official domain-based email address (name@nps4u.or.kr) – apparently, this is due to a very restrictive 10-15 MB storage allocation for each user.

56. Business users directly liaise with the package vendors for issues involving the asset allocation and risk management software products. The IT staff provide full support for the back office and performance evaluation applications – including systems management, database administration, development, and business analysis. Since all the above applications were introduced under a "big bang" approach, there appear to be some gaps relating to integration among the various components and information transfer between applications, some of which are addressed using manual procedures. IT staff appear to be frequently overwhelmed by the amount of follow-up required with each vendor.

57. *Recommendations:* FMC should consider setting up an independent IT team by expanding this current group of four IT staff and tasking them with all asset management related IT functions including technical development, business analysis, project management, and liaison with software vendors. While NPS has renewed its IT systems in 2003, introducing packages to support asset allocation, risk management, back office, and performance evaluation functions, additional work on integration and plugging gaps in the information transfer between applications could be usefully done. There may also be some value in expanding access to the analytical capabilities and market information provided by Bloomberg terminals (of which six are currently available) for all portfolio managers, especially as NPS expands the number of asset classes and markets in which it invests. Finally, expanding access to the official domain-based email system for all NPS asset management staff, and increasing the storage allocation and archival capabilities of this system, will improve the efficiency, transparency, reliability, and security/confidentiality of NPS' global asset management activities that could be increasingly facilitated using this system.

H. Human Resources and Training

58. *Observations:* NPS employs a total of over 5000 staff, of which 89 are in the FMC. Some 60 of these 89 staff are investment professionals, who are employed on 3-year contracts which have a performance-based remuneration component, and which may be renewed if their performance is judged to be acceptable. The Fund Evaluation Team at NPRI determines the overall performance-based compensation for FMC staff, which is then allocated to individual staff by the management of FMC. The FMC comprises eight investment oriented and middle office related teams, in addition to two teams focusing on general and back office functions. As of end-2005, there were six CFAs and two MBAs, in addition to one lawyer, among FMC staff.

59. *Recommendations:* NPS will necessarily transition, over the medium-term, to investing in a broader array of asset classes and geographical markets, and will consequently move away from a largely buy-and-hold investment strategy to a more actively managed, portfolio-based investment approach. This will require NPS staff to be trained in advanced analytical and quantitative techniques, and in the ability to *continually* evaluate new asset classes and geographical markets globally – including non-traditional asset classes – as potential investment opportunities, as well as develop the ability to invest in such asset classes, either through internal or external portfolio managers. Developing a core competence in selecting and effectively monitoring a portfolio of external managers in a wide range of asset classes and markets, including alternative assets, is likely to become a key factor in NPS' future investment performance. This training should also enable NPS staff to provide technical support to

decisions that will need to be made by the Management Committee and other governing bodies on investment policy, benchmarks, risk budgets and allocation, and investment guidelines.

60. While performance-based compensation which is competitive with the market contributes to NPS' ability to attract and retain qualified staff, management should develop a human resource plan aimed at further improving and continuously upgrading its human resources. The plan should include appropriate training opportunities, competitive salaries in accordance with the level of qualifications/skills, performance indicators and career advancement paths. In addition to finance and investments related courses offered by domestic educational institutions, other possibilities for training include the Chartered Financial Analyst (CFA) accreditation program, supported by the CFA Institute. The CFA designation is one of the fastest growing professional credentials in the world and is a globally recognized standard for measuring the competence and integrity of investment professionals. A more specialized training in risk management is the Financial Risk Manager accreditation program, endorsed by the Global Association of Risk Professionals (GARP). NPS staff will also need specialized training in alternative assets investment skills, since this is a major new area of investments for them. The World Bank's technical advisory services could assist in providing the requisite training to staff through both on-site, customized workshops at NPS headquarters; its standard set of specialized annual workshops on different aspects of the investment framework, provided for all its clients; as well as helping to link up NPS with other appropriate sources of training.