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URPL-GP.2652-001/002

Urban Infrastructure Projects Planning (UIPP)

Spring 2024

**Class Information**: **LECTURES** Fridays, 1:45 pm-4:45 pm, 12 Waverly Pl Room L114 **LABORATORY** Saturdays, 10:15 am-12:15 pm, Bobst Room LL112

**INSTRUCTORS** Prof. Leonardo G. Romeo leonardo.romeo@nyu.edu

Prof. Giuliano Bosi giuliano.bosi@nyu.edu

**OFFICE HOURS** By appointment

**Course Description**

This course is about scoping and planning public sector investment projects and the basic knowledge and skills required for their financial and economic appraisal (‘ex-ante’ evaluation).

The focus is on urban infrastructure projects identified, prioritized, and appraised through local/municipal planning processes. Case studies include water supply and sewerage, urban transport, solid waste management, and green infrastructure.

While offered as part of the Wagner’s Master of Urban Planning (MUP) International Planning Specialization and aligned with current practices of international development banks, the UN and other Aid Agencies, the course is intended for policy analysts, urban planners, and engineers working in both developed and developing countries, as most of its technical content is relevant to both contexts.

By taking this course, students should be able to:

* Understand how urban infrastructure projects are identified, prioritized, and appraised within the broader public sector investment programming and capital budgeting processes.
* Appreciate the need for well-prepared “business cases” for urban infrastructure projects.
* Become familiar with the basic finance and welfare economics concepts underpinning the analysis of public sector investments and learn the basics of the Multi-criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) techniques.
* Understand how to assess the financial feasibility and bankability of development projects.
* Understand how to identify, quantify, and value development projects' economic, social, and environmental externalities.
* Practice the integrated (technical, financial, institutional, economic, social, and environmental) appraisal of two urban infrastructure projects of moderate scale and complexity and conduct a relevant risk analysis.

The course combines lectures and computer lab sessions for the financial modeling of projects (in MS Excel) and the application of industry-standard software for probabilistic risk analysis (Oracle’s Crystal Ball)

The achievement of the course objectives will be monitored through one-to-one interaction with the instructors in the laboratory section of the course. It will be assessed through assignments, ‘real world’ project appraisal exercises, and a final exam.

Knowledge and skills acquired in this course would be valuable to students:

1. Considering a career in national/local government urban/regional planning departments,
2. Considering a career in international aid agencies and developmental NGOs, or
3. Considering further specialization in infrastructure project finance and the development of public-private partnerships (PPP).

**Required Readings**

There is no single textbook for this course, but students will be referred to selected sections of:

* G. Jenkins, A. Harberger, G. Kuo. Integrated Appraisal of Investment Projects: Concepts and Practice, Cambridge Resources International (2004)

Materials from the following texts will also be selectively used in the course.

* Asian Development Bank, Guidelines for the Economic Analysis of Projects (2017)
* USAID, The Project Appraisal Practitioners’ Guide (2009)
* Pedro Belli et al., Handbook on Economic Analysis of Investments Operations. World Bank (1998)

**NYU Brightspace**

All announcements, resources, readings, and assignments will be posted on the NYU Brightspace site. Lectures will be posted one week in advance of their delivery.

**Academic Integrity**

Academic integrity is a vital component of Wagner and NYU. Each student is required to sign and abide by [Wagner’s Academic Code](https://wagner.nyu.edu/portal/students/policies/code). Plagiarism of any form will not be tolerated since you have signed an Academic Oath and are bound by the school's academic code. Every student is expected to maintain academic integrity and report violations to us. You should ask if you are unsure about what is expected of you.

**Henry and Lucy Moses Center for Students with Disabilities at NYU**

Academic accommodation is available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website at [www.nyu.edu/csd](http://www.nyu.edu/csd) and click on the Reasonable Accommodations and How to Register tab or call or e-mail CSD at (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodation are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

**NYU’s Calendar Policy on Religious Holidays**

[NYU’s Calendar Policy on Religious Holidays](https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html) states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify the instructor in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.

 **Class Policies**

This is an intensive course; attendance at all classes and laboratory sessions is essential. Students who foresee the necessity to skip more than one session should not enroll in this course.

The instructor will return graded assignments within one week from submission and will generally answer email messages within 24 hours, or sooner if possible. Appointments may be requested for any day of the week.

**Assignments and Evaluation**

Students will be required to:

* Carry out weekly homework assignments to review and assimilate the topics covered each week. The assignments will require answering 2-4 conceptual questions and performing simple spreadsheet calculations in Excel.
* Complete the appraisal of 2 moderately complex projects (see detailed course overview below). and present their conclusions in a one-page memo and an annex including all relevant spreadsheets.
* Take a final exam. The final exam will be a “take-home” assignment. It will include questions to assess conceptual understanding and exercises to demonstrate mastery of project appraisal techniques (including a good grasp of the relevant MS Excel and Crystal Ball functionalities).

All assignments should be submitted through the NYU Brightspace site as a single PDF or MS Word file indicating the student’s name and Wagner mailbox number no later than the deadline posted online. All submissions should be formatted, easily readable, and not excessively fragmented over multiple pages.

The final grade will be based on the above, with the application of the following weights:

* The weekly assignments (25% of the final grade),
* The projects’ appraisal (In-Lab and home-based work) (40% of the final grade)
* The Final Exam (35% of the final grade)

**Overview of the Semester**

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| **PART** | **Week** | **Date** | **Topic** |
| **Part 1 – CONTEXT**Public Investment Management and development projects appraisal | Week 1 | Fri. 3/29Sat. 3/30 | Public Investment Management and Development Projects |
| Week 2 | Fri. 4/5 Sat. 4/6 | Development of the Project “business case” and related methods and tools |
| **Part 2 – METHODOLOGY**Development Project Appraisal through Integrated Cost-benefit Analysis  | Week 3 | Fri. 4/12Sat. 4/13 | Introduction to Integrated Cost-Benefit Analysis and Financial Modelling and Analysis of Investment Operations. |
| Week 4 | Fri. 4/19Sat. 4/20 | Assessment of Externalities and Project Economic, Social, and Environmental Analysis  |
| Week 5 | Fri. 4/26Sat. 4/27 | Project uncertainties and Risk. Sensitivity, Scenarios, and Probabilistic Risk Analysis  |
| **Part 3 – CASE STUDIES**Appraisal of two Urban Development Projects | Week 6  | Fri. 5/3Sat. 5/4 | Appraisal of a Municipal Water Supply Project in a rural town of Nicaragua |
| Week 7  | Fri. 5/10Sat. 5/11 | Appraisal of a Solid Waste Management and Plastic Recycling project in a medium-sized city in Guinea  |

**Grading Scale and Rubric**

Students will receive grades according to the following scale:

There is no A+

A = 4.0 points

A- = 3.7 points

B+ = 3.3 points

B = 3.0 points

B- = 2.7 points

C+ = 2.3 points

C = 2.0 points

C- = 1.7 points

There are no D+/D/D-

F (fail) = 0.0 points

Student grades will be assigned according to the following criteria:

(A) Excellent: Exceptional work for a graduate student. Work at this level is unusually thorough, well-reasoned, creative, methodologically sophisticated, and well written. Work is of exceptional, professional quality.

(A-) Very good: Very strong work for a graduate student. Work at this level shows signs of creativity, is thorough and well-reasoned, indicates strong understanding of appropriate methodological or analytical approaches, and meets professional standards.

(B+) Good: Sound work for a graduate student; well-reasoned and thorough, methodologically sound. This is the graduate student grade that indicates the student has fully accomplished the basic objectives of the course.

(B) Adequate: Competent work for a graduate student even though some weaknesses are evident. Demonstrates competency in the key course objectives but shows some indication that understanding of some important issues is less than complete. Methodological or analytical approaches used are adequate, but the student has not been thorough or has shown other weaknesses or limitations.

(B-) Borderline: Weak work for a graduate student; meets the minimal expectations for a graduate student in the course. Understanding of salient issues is somewhat incomplete. Methodological or analytical work performed in the course is minimally adequate. Overall performance, if consistent in graduate courses, would not suffice to sustain graduate status in “good standing.”

(C/-/+) Deficient: Inadequate work for a graduate student; does not meet the minimal expectations for a graduate student in the course. Work is inadequately developed or flawed by numerous errors and misunderstanding of important issues. Methodological or analytical work performed is weak and fails to demonstrate knowledge or technical competence expected of graduate students.

(F) Fail: Work fails to meet even minimal expectations for course credit for a graduate student. Performance has been consistently weak in methodology and understanding, with serious limits in many areas. Weaknesses or limits are pervasive.

**Detailed Course Overview**

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| **WEEK 1 - Public Investment Management and Development Projects**  |
| **Fri. 3/29** | **Lecture 1** | ***The Management of Public Investment Projects**** Projects as instruments of development planning and aid modality
* Investment Programming and the Project Cycle
* What makes a good public investment Management system (PIMS)?
* Examples of local government capital programming systems

***Urban Infrastructure Projects Planning and Financing (An Overview)**** Sectors and types of Urban Infrastructure projects
* Urban Infrastructure Projects Planning (key processes and issues)
* Urban Infrastructure Project Financing (key instruments and issues)

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 3/30** | **Lab 1** | ***Multicriteria analysis (MCA) and its application to project prioritization**** Scope, strengths, and weaknesses of Multi-Criteria Analysis (MCA)
* The range of MCA methods
* The Analytic Hierarchy Process (AHP)
* Application of AHP to portfolio management

***Reference Materials*** * *[Being prepared]*

***Assignment Week 1**** Apply the AHP to prioritize projects identified through a local strategic planning process. (Background text and MS Excel templates available in Brightspace)
 |
| **WEEK 2 – Development of Project Business Cases and related methods and tools** |
| **Fri. 3/29** | **Lecture 2** | ***The preparation of “business Cases” for Urban Infrastructure Projects**** The G20 Principles and the UK “5-cases Model”
* The strategic case (Project Rationale)
* The economic case (Options appraisal)
* The Commercial case (Commercial viability)
* The Financial case (Long term affordability)
* The Management case (Project deliverability)

***Logic-based approaches to Project Design*** * Construction of Problem/Objective Trees
* The Logical Framework (LF): the method and the tool
* Other logic-based project planning methods / Project Cycle Management (PCM) / Results-Based Management (RBM)
* The Theory of Change (TOC) approach

***Project Prioritization Approaches**** Experience-based Judgement
* Departmental Service level objectives
* Urgency of Need Criteria
* Weighted Rating Systems

***Project Appraisal Methods*** * Cost-benefit analysis (CBA)
* Cost-effectiveness analysis (CEA)
* Least Cost Analysis (LCA)
* Cost-Utility Analysis (CUA)
* Multi-Criteria Analysis (MCA)
* Simplified Methods

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
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| **Sat. 3/30** | **LAB 2** | ***Developing a project’s Logical Framework (LF)**** The Logical Framework: an in-depth look at the method and the tool
* A checklist for the preparation of a Logical Framework
* The LOGFRAMER 3.0 Software
* Presentation of background info on a local development case study
* In-class work to conduct a means-ends analysis and identify strategies and projects relevant to the case study.

***Reference Materials*** * *[Being prepared]*

***Assignment Week 2 (group exercise)**** Selecting relevant strategies and preparing the Logical Framework of a selected project (to be presented in LOGFRAMER 3.0 format)
 |
| **WEEK 3 – Integrated CBA and Financial Analysis of Projects** |
| **Fri. 4/12** | **Lecture 3** | ***Principles of Integrated CBA for Project Appraisal**** Projects as instruments of welfare improvement
* Projects’ costs and benefits as incremental changes
* Project’s opportunity costs

***Points of View in CBA for Project Appraisal**** The issue of standing: Points of view and relevant cash flows
* The Owner’s (Equity holders’) Point of View
* The Total Investment Point of Vies
* The Economic Efficiency (society’s) Point of View
* Other Points of View (e.g. fiscal impact)
* Financial vs. Economic Cost-Benefit Analysis

***Financial Modeling of Projects and Investment Criteria**** The Discounted Cash Flow (DCF) Technique
* Getting the cash flow right
* Getting the cost of capital right (the WAAC)
* Investment Criteria (NPV, IRR, B/C Ratio, Payback Period)
* Estimation and use of debt service ratios (DSCR and LLCR)

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 4/13** | **Lab 3** | ***Financial modeling of a project: an in-class worked-out example***.* Presentation of background info on a case study (toll bridge)
* In-class work to complete the financial model
* In-class work to carry out the financial analysis of the project***Reference Materials***
* *[Being prepared]*

***Assignment Week 3*** * Financial Analysis of municipal investment in new equipment for solid waste management (New Trash Compactor) (Text and templates available in Brightspace)
 |
| **WEEK 4 – Economic, Social, and Environmental Analysis of Projects** |
| **Fri. 4/19** | **Lecture 4** | ***Economic Analysis**** Microeconomics foundations of project economic analysis
* Consumer and producer surplus
* Economic prices in undistorted and distorted markets
* Valuation of incremental and non-incremental inputs and outputs
* Valuation of tradable and non-tradable inputs and outputs
* Calculation and use of Conversion Factors
* The economic opportunity cost of capital
* Winners and losers: distributional analysis and poverty reduction impact

***Social Analysis*** * Jobs Creation
* Enhanced public safety.
* Community cohesion, displacement, gentrification
* Health impacts

***Environmental Analysis**** Valuing Environmental costs and benefits
* Methods of non-market valuation
* Revealed Preferences Methods
* State Preferences Methods
* Benefit Transfers Methods.

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 4/20** | **Lab 4** | ***Moving from Financial to Economic Analysis of projects**** Presentation of background info on a case study (to be determined)
* In-class work to carry out the economic analysis of the project
* In-class work to determine the distributional effect and poverty reduction impact of the project

***Reference Materials*** * *[Being prepared]*

***Assignment Week 4**** Calculating the economic price of water (Text and templates available in Brightspace)
* Calculating Conversion factors for traded and non-traded inputs and outputs (Text and templates available in Brightspace)
 |
| **WEEK 5 – Project Risk Analysis** |
| **Fri. 4/26** | **Lecture 5** | ***Projects Sensitivity, Scenarios and Probabilistic Risk Analysis**** Assessing Project Risks
* Sensitivity Analysis
* Scenario Analysis
* Monte-Carlo Simulations
* Building a forecasting model
* Selecting key risk variables
* Running simulations
* Assessing correlation conditions among risk variables
* Analyzing the results of simulations

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 4/27** | **Lab 5** | ***Project Risk Analysis with Crystal Ball © software*** * Using “Crystal Ball” to select key risk variables.
* Developing Tornado Charts
* Developing Spider Charts
* Simultaneous assessment of project sensitivity to multiple risk variables
* Using CB to build a custom probability distribution from available data.
* Getting and formatting the historical data
* Identifying trends and disturbances
* Determining the range and intervals of errors’ frequency distributions
* Computing and adjusting the error probability distributions.

***Reference Materials*** * *[Being prepared]*

***Assignment Week 5**** Developing a probability distribution from available historical data (Text and templates for the exercise available in Brightspace)
 |
| **WEEK 6 – Case Study 1: Appraisal of a Water Supply Project** |
| **Fri. 5/3** | **Lecture 6** | ***Technical Components of Urban Water Supply Systems**** **Source**
* **Intake Structures**
* **Treatment Plants**
* **Storage Facilities**
* **Distribution System**
* **Consumer Connection**
* **Wastewater Collection and Treatment**

***Ownership and management models**** **Public Ownership and Management**
* **Private Ownership and Management**
* **Public-Private Partnerships (PPPs)**
* **Community-Based Management**
* **Hybrid Models**
* **Regulations and Standards**

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 5/4** | **Lab 6** | ***Integrated Appraisal of a Water Supply project**** Presentation of background info on a case study (Reconstruction of the water supply system in a rural town of Nicaragua)
* In-class work to carry out the project's financial, economic, social, and environmental analysis.
* In-class work to determine the distributional effect and poverty reduction impact of the project

***Reference Materials*** * *Project Profile available in Brightspace*
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| **WEEK 7 – Case Study 2: Appraisal of a Solid Waste Management and Recycling Project** |
| **Fri. 5/10** | **Lecture 7** | ***Elements of Integrated Sustainable Waste Management Systems**** Waste Collection: Protecting public health.
* Waste Treatment and Disposal: Front Lines of Environmental protection
* Resources Management: Valorizing recyclables and organic materials and conserving resources.

***Waste Management Governance Features*** * Inclusivity
* Financial Sustainability
* Sound Institutions and proactive policies

***Required Readings**** *[Being prepared]*

***Reference Materials*** * *[Being prepared]*
 |
| **Sat. 5/11** | **Lab 7** | ***Integrated Appraisal of a Solid Waste Management project**** Presentation of background info on a case study (Municipal Solid Waste Management in the city of Mamou- Guinea)
* In-class work to carry out the financial, economic, social, and environmental analysis of the project.
* In-class work to determine the distributional effect and poverty reduction impact of the project

***Reference Materials*** * *Project Profile available in Brightspace*
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