

International School of Excellence in Systems Analysis and Systems Solutions

Concept Paper

Rationale

The world is becoming more complex and interconnected. The global interrelatedness of economics, politics, the environment, poverty and equity, security, energy and resources, and food and water means that very few of the challenges and issues facing societies in the 21st century can be considered in isolation from each other, either geographically, politically, or sectorally. How societies and nations address and meet these complex challenges in a cohesive, comprehensive, and integrated manner will determine the fate of the world and human wellbeing in the coming decades. Failure to recognize the deep integration of all aspects of modern society and respond accordingly will ultimately lead to increased social and political conflict, entrenchment of global poverty and inequity, and environmental disaster.

Never more than now, will science play a critical and integral role in helping governments and societies understand these complexities and interconnections and assist in developing integrated solutions to address these challenges both globally and locally. In particular, systems analysis and systems science, with its integrated interdisciplinary approach, will be fundamental.

However, just when the need is greatest, the number and quality of scientists working in integrative systems science is still limited. This is particularly evident at early and mid-career levels. At the most senior academic and research levels, employment security provides scientists the freedom to think and operate in a more interdisciplinary and holistic manner. At junior levels, such as PhD candidates, there is also considerable flexibility to explore different research disciplines, and there are a limited number of graduate programs worldwide directed towards developing interdisciplinary and systems thinking, although the majority of PhD programs still maintain a strong disciplinary focus. Unfortunately the nature of tenure track or equivalent career development pathways means that early to mid-career researchers are constrained and encouraged and rewarded to develop and maintain a strong single discipline focus. Opportunities for long-term cooperative, integrated, interdisciplinary research are very limited. In addition, national research funding agencies typically remain focused on individual short-term research project funding. Clearly there is a need to develop and support a strong international cohort of high quality integrative thinkers and researchers capable of developing integrated interdisciplinary solutions to global challenges.

The International School of Excellence in Systems Analysis and Systems Solutions

Overview

The International School of Excellence (ISE) is conceived as a cooperative research and capacity building initiative engaging early career scholars from around the world in a five-year program to consider integrated approaches to critical transitions in key global problem areas and develop a new generation of systems analysis researchers

and integrative thinkers. These complex problems will be approached from a range of perspectives: geographical, disciplinary, methodological, and societal relevance (economic, cultural, behavioral, international relations, industry, policy, development). The initiative will emphasize the use of systems analysis approaches to integrate perspectives and identify co-benefits of transition pathways, with a strong science to policy focus. The program will encourage participating scholars to think broadly about the problem and to consider factors and ramifications beyond their specific area of research focus.

Uniqueness

The ISE concept is unique in that it has a truly global focus, both in terms of the research questions being addressed and the geographic spread of participating scholars. In addition, the ISE:

- Provides the continuity and commitment, five years of funding, often lacking in modern research.
- Actively promotes and supports interdisciplinary research and integration through cooperation, collaboration and participation, thus promoting a sense of ownership and community building among participants.
- Is focused around an integrated research program of global significance, with all participants developing and applying their individual skills within a broader context.
- Will require that each ISE scholar will spend 2-3 months at IIASA as a single cohort to promote integration and collaboration.

These latter two elements are outlined below.

The Role of IIASA

The International Institute for Applied Systems Analysis (IIASA) will play the lead role within the ISE, both in terms of developing, guiding and conducting the research program, and in the coordination and facilitation of the ISE. IIASA, with its mission to “*provide insight and guidance to policymakers worldwide by finding solutions to global and universal problems through applied systems analysis in order to improve human and social wellbeing and to protect the environment*” is uniquely placed globally to expedite the ISE. IIASA has a long and successful history of developing systems-based integrated solutions and policy advice for some of the world’s most pressing problems, including energy resources, climate change, environmental pollution, population demographics, land use and sustainable development. Research conducted within and across IIASA’s research programs will be fundamental and integral to the overall ISE research program and each ISE scholar will partner with researchers in one or more of IIASA’s Research Programs and/or cross-cutting initiatives. IIASA is both international, with active collaborations in over 60 countries, and politically independent, with its core funding provided by prestigious scientific institutions across its 22 National Member Organizations (NMOs).

The Research Program (To be further elaborated)

The foundation of the ISE concept and one of its truly unique features is that all scholars, across all participating research institutions including IIASA, will be undertaking research on a single interdisciplinary research topic. The topic will be chosen by IIASA researchers in consultation with external experts and funding agencies and will be truly global in context. It will address one of the major global 21st

century challenges, for example the transition to a carbon neutral world. Each scholar will contribute their individual disciplinary skills to build an international multidisciplinary team. In addition, each scholar will be encouraged, and supported, to establish active collaborations with other scholars domestically, internationally and within IIASA. Scholars will be selected to cover a broad variety of disciplines across the physical, natural, and social sciences.

ISE@IIASA Program

The ISE is not designed to be a 'single campus school' – rather each participating scholar will be based, and spend most of their time, in-country at their host institution. However, each year all ISE scholars will be brought together as a cohort for 2-3 months to promote integration and collaboration, funded by the ISE. During this period they will work together, and with their research partners at IIASA, to integrate their research into the broader research program context and explore opportunities for further collaboration and integration. It is envisaged that during this time a 1-2 week period will be 'retreat-style' to enable free-flowing discussions in an informal setting. This time at IIASA is critical for the scholars to develop their skills in multi- and interdisciplinary thinking, systems approaches, and integration – a core goal of the ISE.

Operational Overview

- A cohort of ~50 top-level early to mid-career researchers (<10 years post PhD), with expertise spread broadly across disciplines, will be selected to study aspects of a common project/program.
- The scholars will be high-caliber researchers in secure academic positions (tenure track or equivalent), and will have broad latitude in conducting their research.
- Each scholar will be based at their home institution and spend most of their time in country.
- Each scholar is expected to commit 50% of their time to their ongoing participation within the ISE, acknowledging the fact that scholars will need to maintain their own individual research program (outside that of the ISE). As such, the ISE will cover 50% of their academic salary (plus overheads).
- In addition, each scholar will be provided funding equivalent to one full-time postdoctoral fellow and one full-time postgraduate student to work on the program.
- The scholar will also receive funding and logistical support to facilitate moves horizontally between participating institutions, to foster collaboration.
- Each scholar will partner with researchers in one or more of IIASA's Research Programs and/or cross-cutting initiatives.
- To promote integration and systems analytic approaches, the full cohort of scholars will spend part or all of a 2-3 month period, together as a group, each year at IIASA, funded by the ISE. It is envisaged that this will include a 1-2 week retreat style meeting to openly discuss progress and explore new ideas.

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- IIASA will make a significant contribution to the ISE both academically and financially. Specifically IIASA will:
 - Develop the ISE Concept Proposal and solicit initial and ongoing funding
 - Develop the ISE Research Program, utilizing its international network
 - Establish and play an active role in the ISE Governing Board
 - Establish and play an active role in the ISE International Faculty
 - Contribute the equivalent of approximately 20-25 FTE scientific staff to the ISE research program
 - Host the ISE Faculty Office
 - Host the ISE@IIASA Program
- As part of IIASA's contribution to the ISE it will contribute core funding, equivalent to 100% of one full-time senior research scholar for each participating IIASA program
- Each participating research program within IIASA will receive funding equivalent to one full-time postdoctoral fellow and one full-time postgraduate student to work specifically in collaboration with their external counterparts on the project/program.

Governance and Establishment

- Initially an ISE Governing Board will be established comprising eminent international scholars, nominated by IIASA in consultation with external experts and funding agencies. The Governing Board will be responsible for oversight and evaluation of the ISE.
- The ISE Research Program will be developed by IIASA utilizing its international network, in consultation with funding agencies, and approved by the ISE Governing Board.
- The ISE Governing Board will meet once per year for a 2-3 day period at IIASA.
- A coordinated open call will be made jointly within each participating IIASA NMO country for interested scholars to participate in the ISE. The call will outline the research program being undertaken and the required disciplinary skills of participants. It is envisaged that such calls will be undertaken utilizing existing in-country mechanisms used by the respective funding agencies, e.g., NSF, ERC, DFG, etc. Scholars will be expected to have the full support of their host institution.
- Initially the call process may be orchestrated through Belmont Forum countries, with possible later expansion to include other IIASA NMO and IGFA member countries.
- A selection panel comprising IIASA and the ISE Governing Board will make the final selection of ISE scholars, in consultation with relevant funding agencies. The selection panel will ensure that the final cohort of scholars has the necessary disciplinary and geographic coverage for the research program.
- An ISE International Faculty composed of IIASA researchers, senior scholars from participating research institutions, external collaborators, and funders will oversee the scientific implementation of the ISE.
- The Faculty will meet twice per year for a 2-3 day period at IIASA, with one meeting in conjunction with the ISE Governing Board meeting.

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- The ISE Faculty will be supported by a Faculty Office, headed by a full-time 'Dean' (selected by the ISE Faculty), with 2-3 support staff, based at IIASA, to provide operational management of the ISE.

An overview of the proposed ISE structure and governance, establishment and operational arrangements is shown in Appendix 1.

Funding and Budget

The ISE is a special collaborative project between IIASA and its NMOs, and therefore program support is expected to come from agencies in the NMO countries already involved in IIASA core funding. Additional backing will be sought from public and private sources within participating countries and internationally.

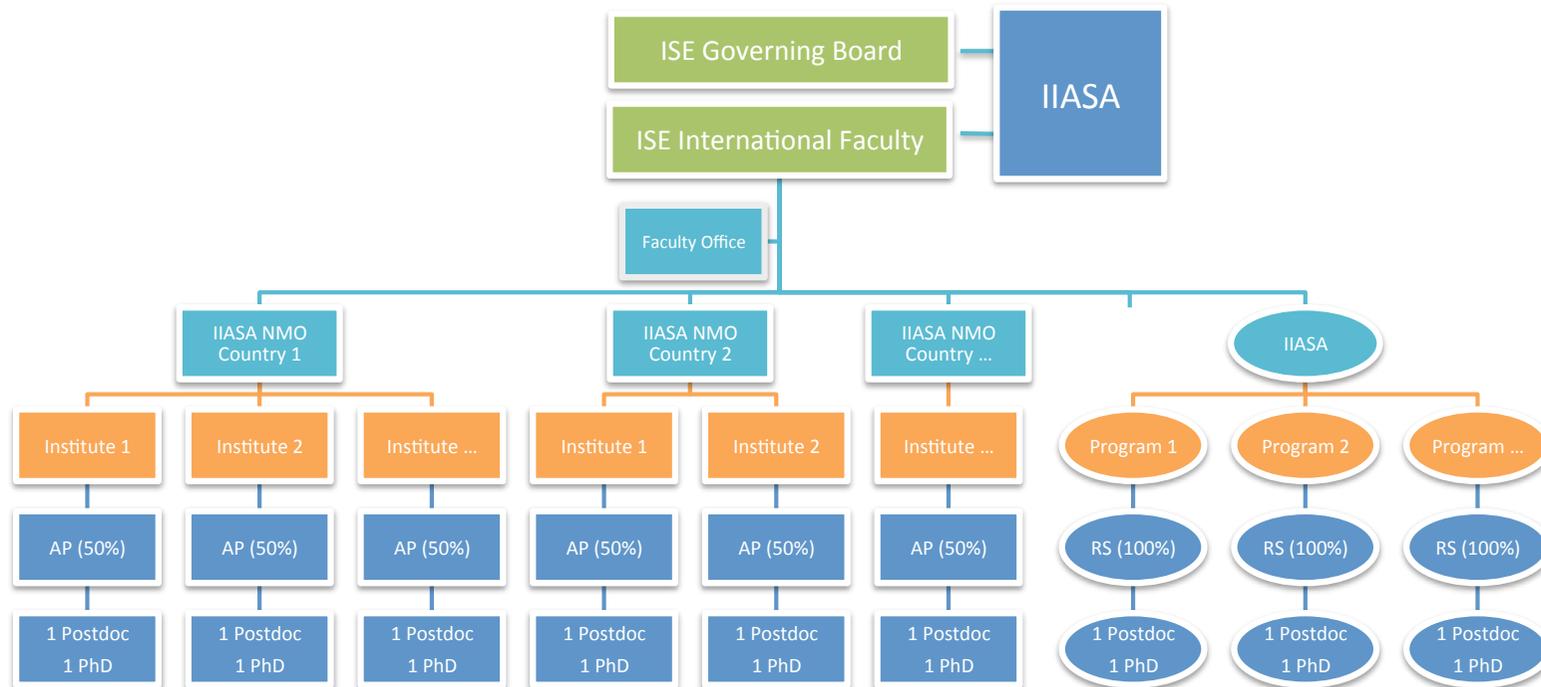
Summary budgets for the operation of the ISE over the five-year period are shown in the tables below. Detailed year-by-year budgets for the operation of the ISE with explanatory notes can be found in Appendix 2.

Summary Estimated Budget for ISE Operations over 5 years for 50 Scholars	
Description	Amount (€)
<i>Funding Agency Contributions</i>	
Funding to scholars in-country	32,364,133
Funding to IIASA to operate the ISE	13,270,563
Funding Agency Sub Total	45,634,695
IIASA Contribution	6,244,848
Grand Total	51,879,543

Summary Estimated Budget for ISE Operations over 5 years for 30 Scholars	
Description	Amount (€)
<i>Funding Agency Contributions</i>	
Funding to scholars in-country	19,418,480
Funding to IIASA to operate the ISE	11,024,395
Funding Agency Sub Total	30,442,874
IIASA Contribution	6,244,848
Grand Total	36,687,722

Appendix 1

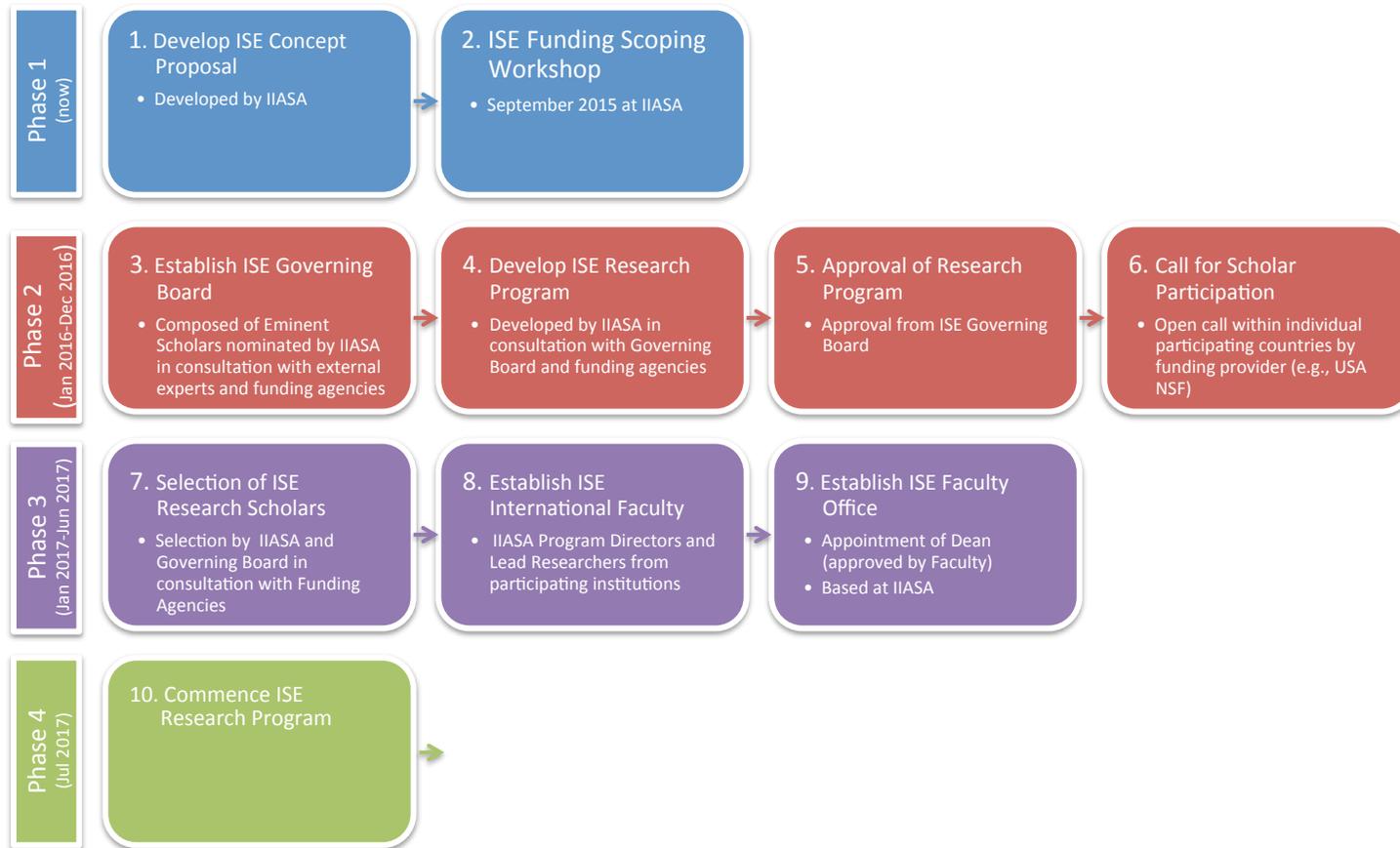
International School of Excellence (ISE)
Proposed Organizational Structure



NMO = National Member Organization
AP = Assistant/Associate Professor (or equivalent)
RS = Research Scholar (or equivalent)

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Proposed Process and Timeline for Establishing ISE

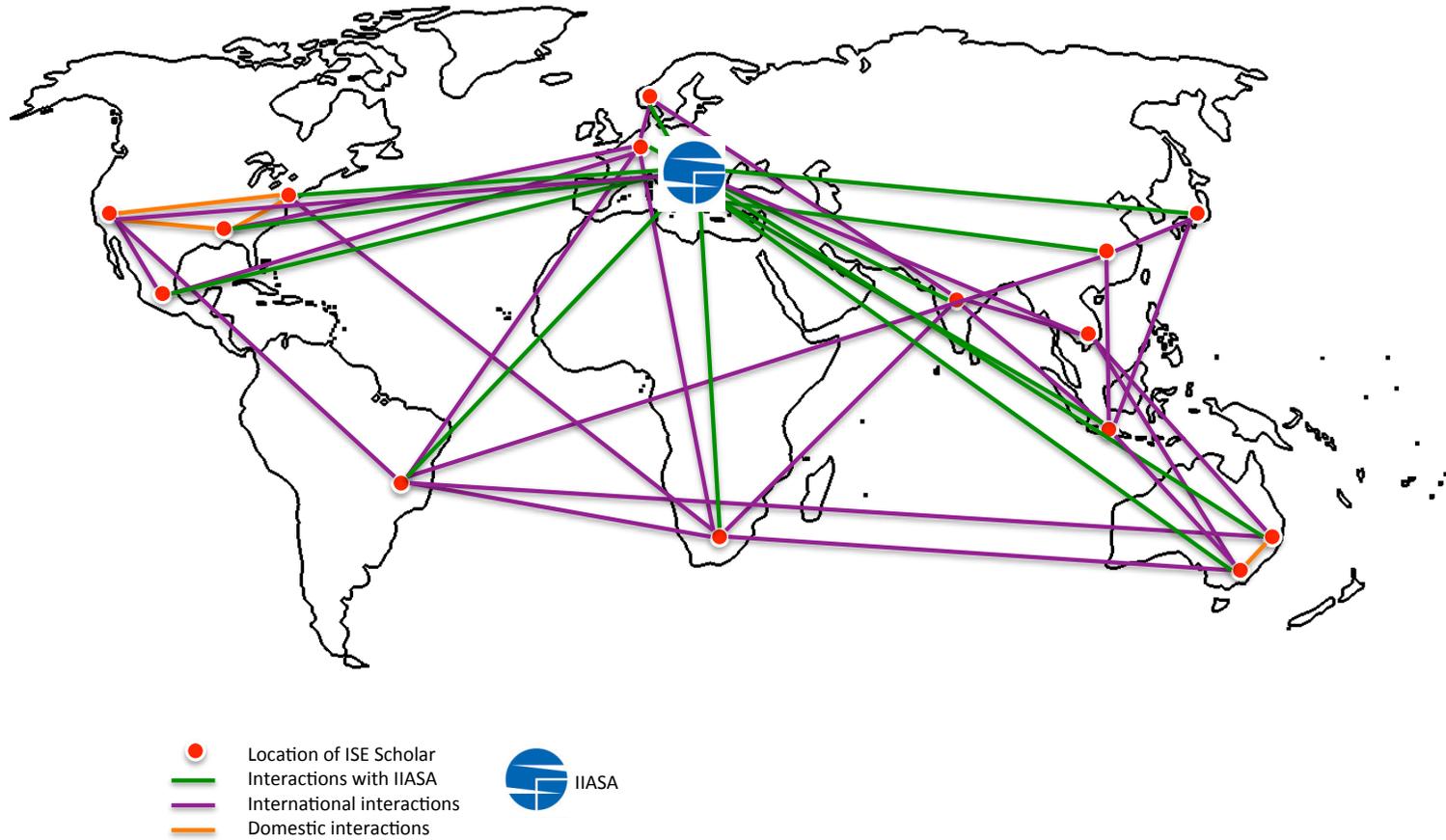


Interactions between ISE Scholars and IIASA



Different colored circles represent ISE scholars in different countries
The solid background represents the overarching ISE Research Program

Potential International Collaboration among ISE Scholars



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Appendix 2 – Estimated ISE Budget for 50 and 30 Participating Scholars respectively

International School of Excellence Estimated Budget (50 Participating Scholars)									
(all figures in €)									
Description	%	Cost	n	Year 1	Year 2	Year 3	Year 4	Year 5	Total
International									
<i>Salaries</i>									
Scholar	50	52,647	50	1,316,170	1,342,494	1,369,344	1,396,731	1,424,665	6,849,404
Postdoc	100	30,902	50	1,545,091	1,575,993	1,607,513	1,639,663	1,672,456	8,040,715
PhD	100	19,029	50	951,432	970,460	989,870	1,009,667	1,029,860	4,951,289
Indirect Costs				1,906,347	1,944,474	1,983,363	2,023,030	2,063,491	9,920,704
Salaries Subtotal				5,719,040	5,833,421	5,950,089	6,069,091	6,190,473	29,762,113
Travel		10,000	50	500,000	510,000	520,200	530,604	541,216	2,602,020
International Subtotal				6,219,040	6,343,421	6,470,289	6,599,695	6,731,689	32,364,133
IIASA									
<i>Salaries</i>									
FO Dean	100	100,000	1	100,000	102,000	104,040	106,121	108,243	520,404
FO Support Staff	100	37,000	2	74,000	75,480	76,990	78,529	80,100	385,099
Postdoc Salary	100	39,000	10	390,000	397,800	405,756	413,871	422,149	2,029,576
PhD Salary	100	26,000	10	260,000	265,200	270,504	275,914	281,432	1,353,050
Indirect Costs				412,000	420,240	428,645	437,218	445,962	2,144,065
Salaries Subtotal				1,236,000	1,260,720	1,285,934	1,311,653	1,337,886	6,432,194
Travel (Research Staff)		3,500	10	35,000	35,700	36,414	37,142	37,885	182,141
Travel (Faculty)				50,000	51,000	52,020	53,060	54,122	260,202
ISE Governing Bd Meeting		60,000	1	60,000	61,200	62,424	63,672	64,946	312,242
ISE Faculty Meeting		45,000	2	90,000	91,800	93,636	95,509	97,419	468,364
Meeting Subtotal				150,000	153,000	156,060	159,181	162,365	780,606
ISE@IIASA Program		15,000	50	750,000	765,000	780,300	795,906	811,824	3,903,030
Indirect ISE@IIASA	50	13,162	50	329,050	335,631	342,344	349,190	356,174	1,712,389
IIASA Subtotal				2,136,000	2,178,720	2,222,294	2,266,740	2,312,075	13,270,563
Funding Agencies Total				8,355,040	8,522,141	8,692,583	8,866,435	9,043,764	45,634,695
IIASA Contribution									
Salary Senior RS	100	80,000	10	800,000	816,000	832,320	848,966	865,946	4,163,232
Indirect Costs				400,000	408,000	416,160	424,483	432,973	2,081,616
IIASA Contribution Total				1,200,000	1,224,000	1,248,480	1,273,450	1,298,919	6,244,848
Grand Total				9,555,040	9,746,141	9,941,063	10,139,885	10,342,682	51,879,543

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International School of Excellence Estimated Budget (30 Participating Scholars)									
(all figures in €)									
Description	%	Cost	n	Year 1	Year 2	Year 3	Year 4	Year 5	Total
International									
<i>Salaries</i>									
Scholar	50	52,647	30	789,702	805,496	821,606	838,038	854,799	4,109,642
Postdoc	100	30,902	30	927,055	945,596	964,508	983,798	1,003,474	4,824,429
PhD	100	19,029	30	570,859	582,276	593,922	605,800	617,916	2,970,774
Indirect Costs				1,143,808	1,166,684	1,190,018	1,213,818	1,238,095	5,952,423
Salaries Subtotal				3,431,424	3,500,052	3,570,053	3,641,454	3,714,284	17,857,268
Travel		10,000	30	300,000	306,000	312,120	318,362	324,730	1,561,212
International Subtotal				3,731,424	3,806,052	3,882,173	3,959,817	4,039,013	19,418,480
IIASA									
<i>Salaries</i>									
FO Dean	100	100,000	1	100,000	102,000	104,040	106,121	108,243	520,404
FO Support Staff	100	37,000	2	74,000	75,480	76,990	78,529	80,100	385,099
Postdoc Salary	100	39,000	10	390,000	397,800	405,756	413,871	422,149	2,029,576
PhD Salary	100	26,000	10	260,000	265,200	270,504	275,914	281,432	1,353,050
Indirect Costs				412,000	420,240	428,645	437,218	445,962	2,144,065
Salaries Subtotal				1,236,000	1,260,720	1,285,934	1,311,653	1,337,886	6,432,194
Travel (Research Staff)		3,500	10	35,000	35,700	36,414	37,142	37,885	182,141
Travel (Faculty)				50,000	51,000	52,020	53,060	54,122	260,202
ISE Governing Bd Meeting		60,000	1	60,000	61,200	62,424	63,672	64,946	312,242
ISE Faculty Meeting		45,000	2	90,000	91,800	93,636	95,509	97,419	468,364
Meeting Subtotal				150,000	153,000	156,060	159,181	162,365	780,606
ISE@IIASA Program		15,000	30	450,000	459,000	468,180	477,544	487,094	2,341,818
Indirect ISE@IIASA	50	13,162	30	197,430	201,379	205,406	209,514	213,705	1,027,434
IIASA Subtotal				1,836,000	1,872,720	1,910,174	1,948,378	1,987,345	11,024,395
Funding Agencies Total				5,567,424	5,678,772	5,792,348	5,908,195	6,026,359	30,442,874
<i>IIASA Contribution</i>									
Salary Senior RS	100	80,000	10	800,000	816,000	832,320	848,966	865,946	4,163,232
Indirect Costs				400,000	408,000	416,160	424,483	432,973	2,081,616
IIASA Contribution Total				1,200,000	1,224,000	1,248,480	1,273,450	1,298,919	6,244,848
Grand Total				6,767,424	6,902,772	7,040,828	7,181,644	7,325,277	36,687,722

Budget Explanatory Notes

- Salary figures are based on the current salaries for Assistant Professor, Postdoctoral Fellow, and PhD Candidate averaged across 11 potentially participating NMO countries. These values will change if there are a disproportionate number of scholars among countries.
- Costs for Years 2-5 are based on a 2% inflation rate.
- Indirect costs (overheads) are estimated at 50% of direct salary costs.
- ISE Governing Board and Faculty meeting costs are based on current IIASA Council Meeting costs.
- ISE@IIASA Program costs cover accommodation for 3 months and return airfares.
- IIASA indirect costs for the ISE@IIASA program are based on 50% of the average ISE scholar salary for 3 months.
- IIASA costs and contribution are based on 10 Research Programs or initiatives participating in the ISE.
- Calculations are based on 2014 numbers and may change depending on actual start date due to potential cost of living increases.

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