

IAEA-CN301-xxx

Challenges and strategies to strengthen Self-Reliance and Sustainability of National Nuclear Institutions

Preliminary conclusions and highlights from a cooperative approach and networking empowerment in Latin America.
(RLA0069)

Facundo Deluchi

.....

facundodeluchi@gmail.com

INTERNATIONAL CONFERENCE ON

ACCELERATORS FOR RESEARCH AND SUSTAINABLE DEVELOPMENT

From good practices towards socioeconomic impact



23-27 May 2022

IAEA Headquarters, Vienna, Austria

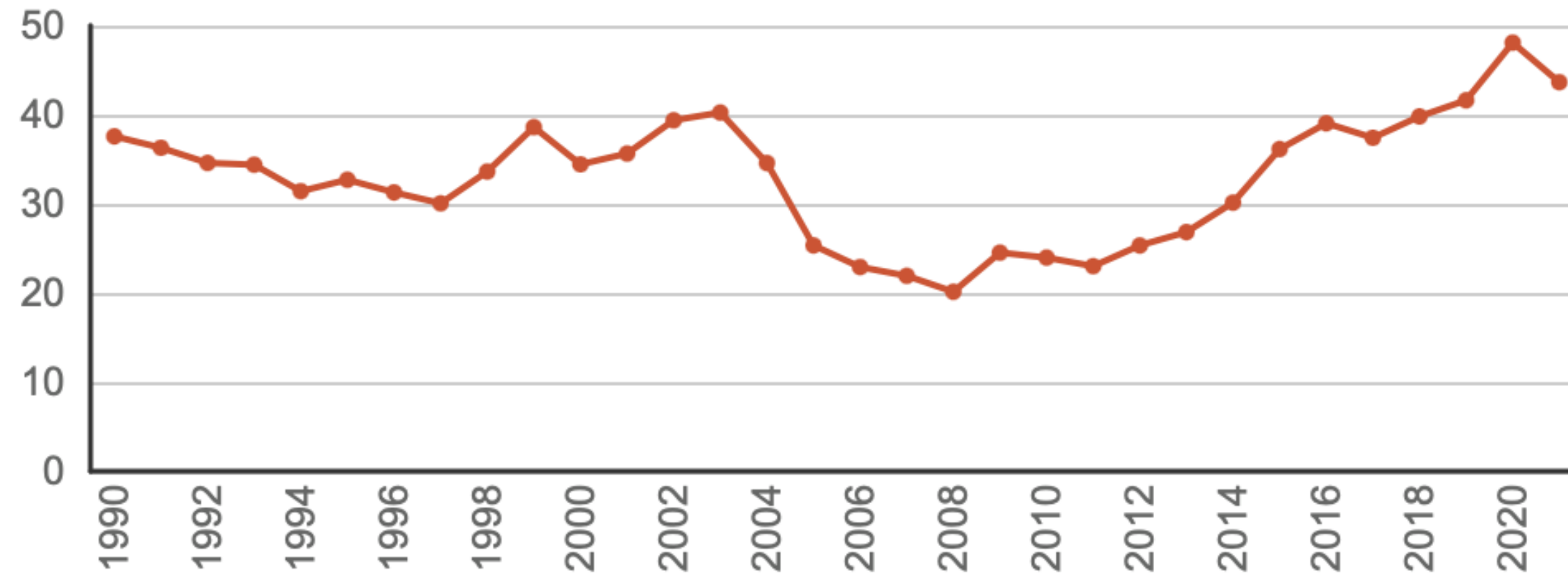
Sustainability understood as a process or state that can be maintained at a desired level for as long as is needed.



Some indicators from the Latin American Context

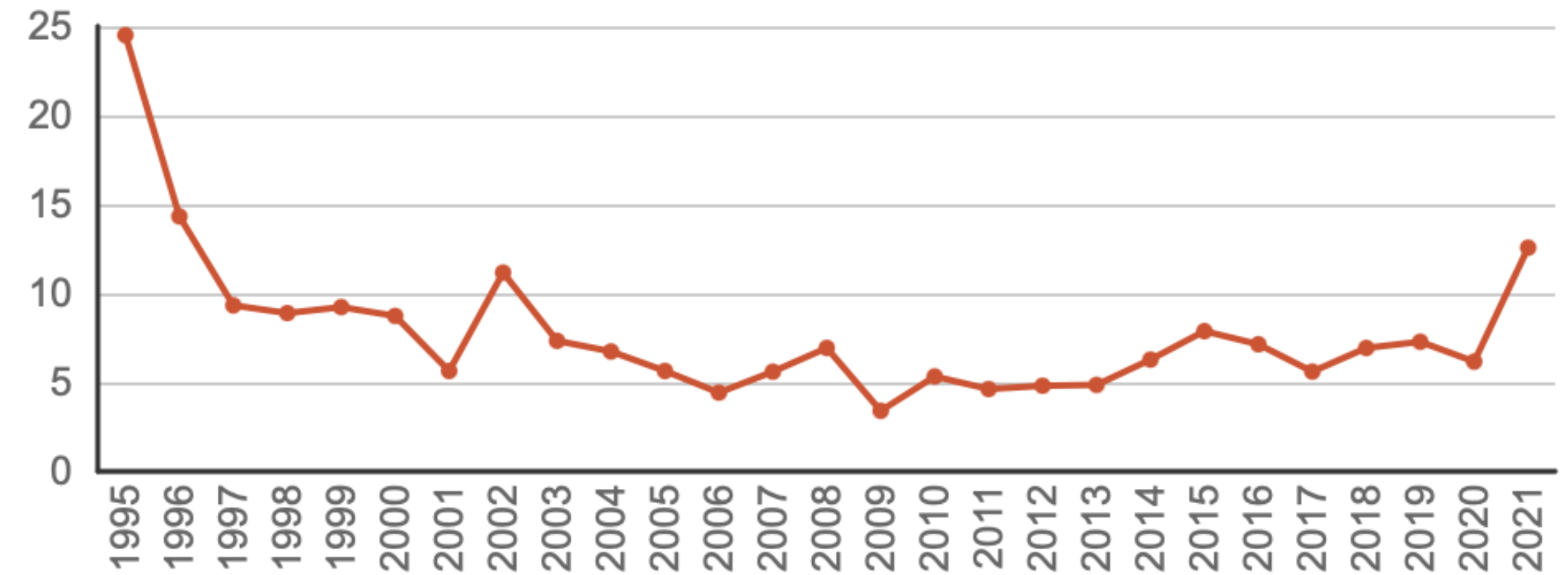
Total external debt as percentage of GDP

(Percentage)
1990 - 2021



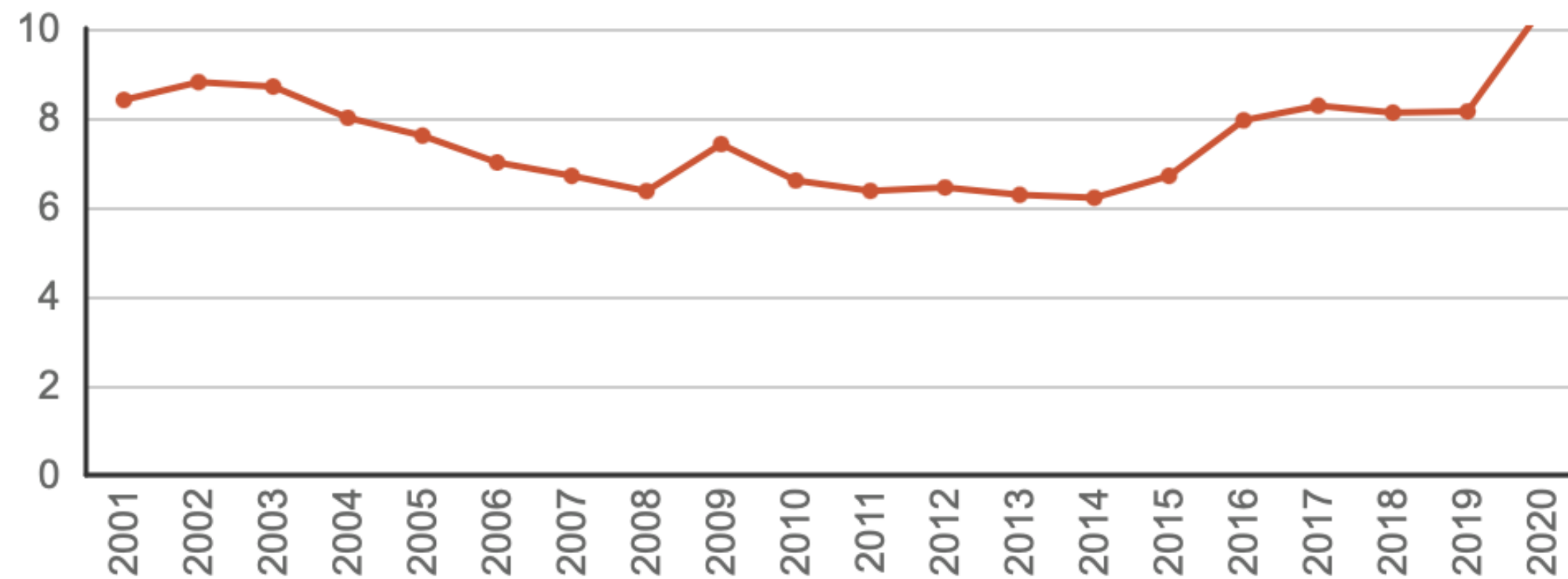
Annual growth rate of the consumer prices index: december to december

(Percentage)
1995 - 2021



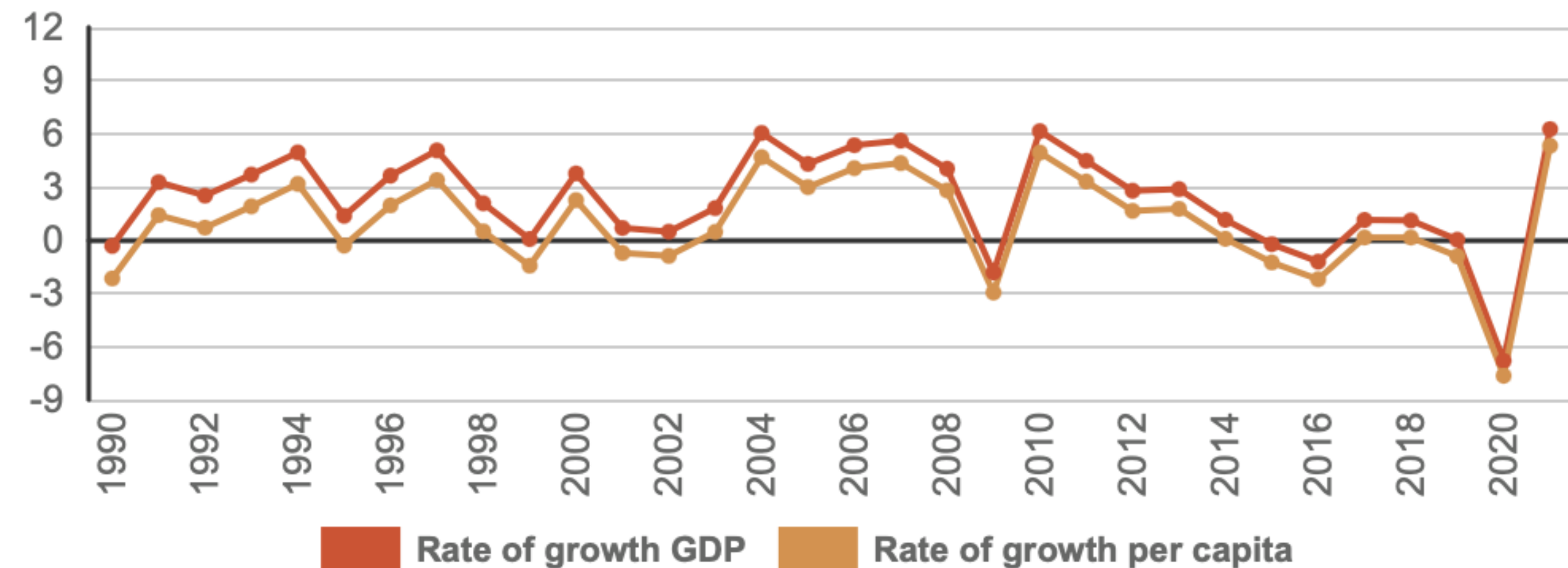
Unemployment rate

(Percentage)
2001 - 2020



Annual growth rates at constant prices of 2010: Total GDP & GDP per capita

(Percentage)
1990 - 2021



Guidelines for the establishment of IRF

National Nuclear Institutions (NNIs), universities, medical centres, and private companies have established and used IRFs not only for **research and development** (R&D) purposes but also for **provision of commercial services and goods**. As the number of deployments of IRFs continues to increase, the importance of **professional management** of IRF projects has to be highlighted, in particular for the institutions and organizations with little or no experience in the area. Indeed, the IRF project needs to be planned, managed and conducted in such a way that it guarantees successful progress of its implementation and full utilization after the facility begins operation and provision of services. In addition, **the essential infrastructure issues** need to be assessed and established before start of operations. These factors stimulated the preparation of the current publication for guiding the establishment of IRFs by using a **phased project milestones methodology** and applying a tailored approach based on the degree of complexity of the IRF.

It is intended to provide guidance for the organizations and institutions working on IRF projects in order to enable them to undertake the project in a well-organized manner. It includes some considerations for a feasibility study of an IRF which takes **preliminary strategic planning, assessment of infrastructure issues, and cost–benefit analysis** as the key elements. In addition, it provides detailed methodologies on how to assess the status of necessary infrastructure and to determine the efforts required for such infrastructure development in a phased approach, including information on existing IAEA peer reviews, advisory services, databases and other electronic information resources. The guidance also aims to help Member States as well as their respective organizations understand their commitments and obligations associated with an IRF project, including the existence of an **appropriate legal and regulatory framework for safety and security of radioactive materials** prior to consideration of an IRF project.



Different Dimensions Involved in IRF Sustainability



Some Initial Considerations...

Does the Institution have:

- the institutional capability to support Project development?
- the financial resources to support Project development?
- the human resources to support Project development?
- the infrastructure to support Project development?
- the required legal framework and certifications?

And if it does not, has the Institution developed a realistic plan of how to get “there” and close those gaps?



Conditions to strengthen financing opportunities

To raise financing you must “Tell the Story”.

Describe in detail:

- The context, the background situation
- An intervening complication, problem or opportunity
- How the proposed project is the “solution”
- The cost and benefit of the project
- The unbiased fact-base you are relying on
- The critical team members you have recruited who can execute the plan

Brian Monaghan, RLA0069



Conditions to strengthen financing opportunities

A financeable project exhibits the following:

- A strong customer base or potential for growth
- A competitive advantage (price, quality, delivery etc.)
- A strong technical and marketing staff
- An autonomous organization with an "entrepreneurial" spirit, able to control its revenue, set prices
- Freedom to defray risk by entering partnerships
- An "exit strategy" for the investors, ie. a way to sell their interest

Brian Monaghan, RLA0069



The key role of Regulators

Capability of the Nuclear Regulator

- Key Questions:

- Does the host country have a competent regulator in terms of both experience and technology-specific knowledge?
- Is the regulator independent?
- Does it have the requisite authority to act?
- Will it take action when appropriate?
- Will limitations be imposed as to technology type?

- The regulatory body must:

- Have adequate legal authority, technical & managerial competence, and human & financial resources to fulfill its responsibilities
- Be able to demonstrate its regulatory experience

- Note that regulatory capability is a key consideration for financing entities

- The regulator needs to be the “adult in the room” that watches over the project during both construction and operation
- Challenge for financing entities: assessing regulatory competence

Paul Murphy, Argonne Workshop for Young Leaders, 2021 (RLA0069)



Additional Nuclear Regulatory Considerations

- Recognition of country-of-origin licensing
- Cooperation with country-of-origin regulator (e.g., training)
 - Note the difference between education / training and practical regulatory experience
- What is the licensing approach of the host country regulator?
 - Is the regulatory regime modeled after a recognized foreign regime?
- What will the licensing process be for:
 - Design certification
 - Site permit
 - Construction license
 - Operating license
 - Environmental permits
- Is a “reference facility” approach going to be used?
 - Note that site specific considerations will still need to be assessed
 - Can a reference plant approach be a tool to reduce regulatory uncertainty?



Stakeholders engagement

The nuclear industry involves a great many Stakeholders due to the long-term and sensitive nature of nuclear power and research reactors.

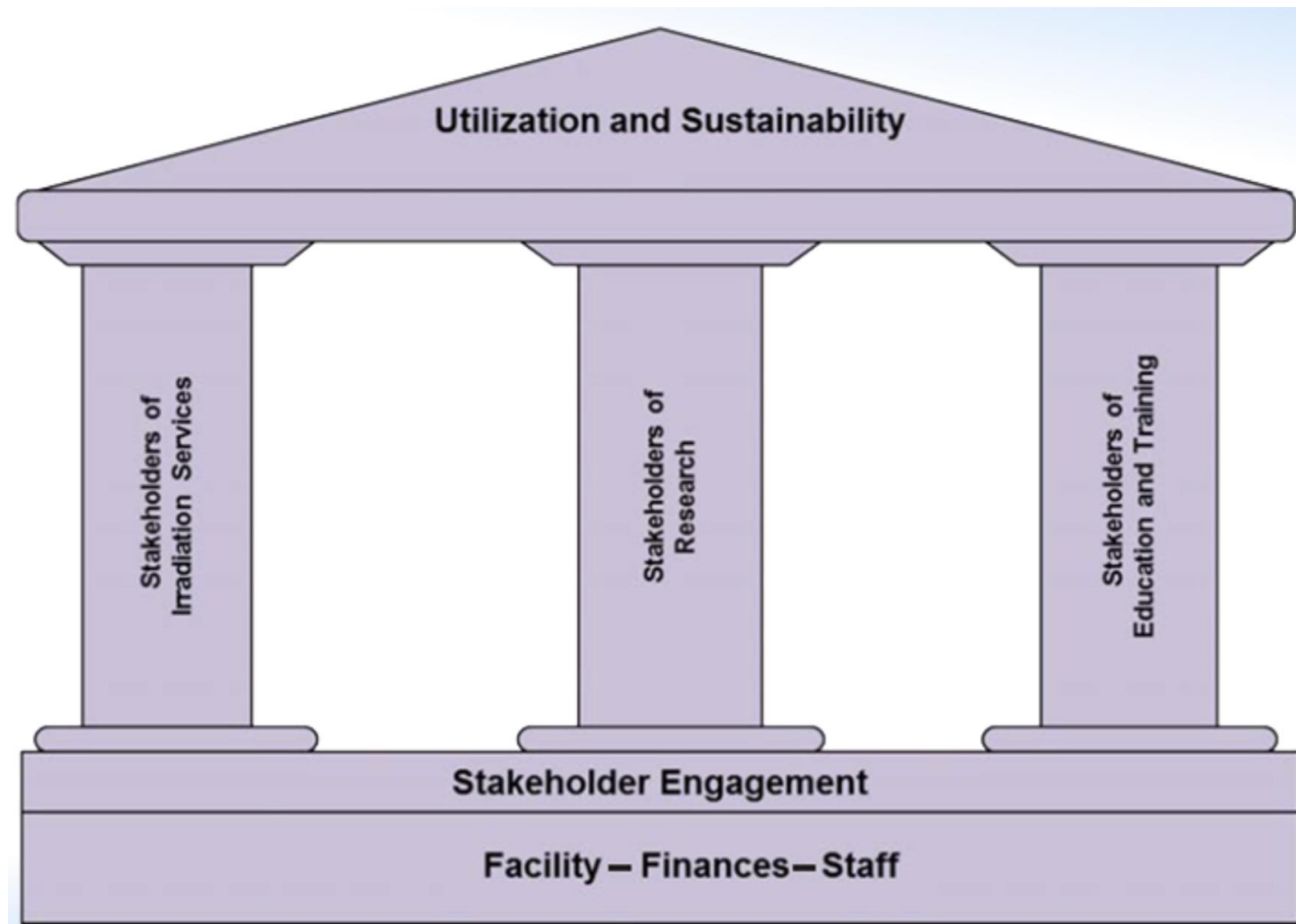
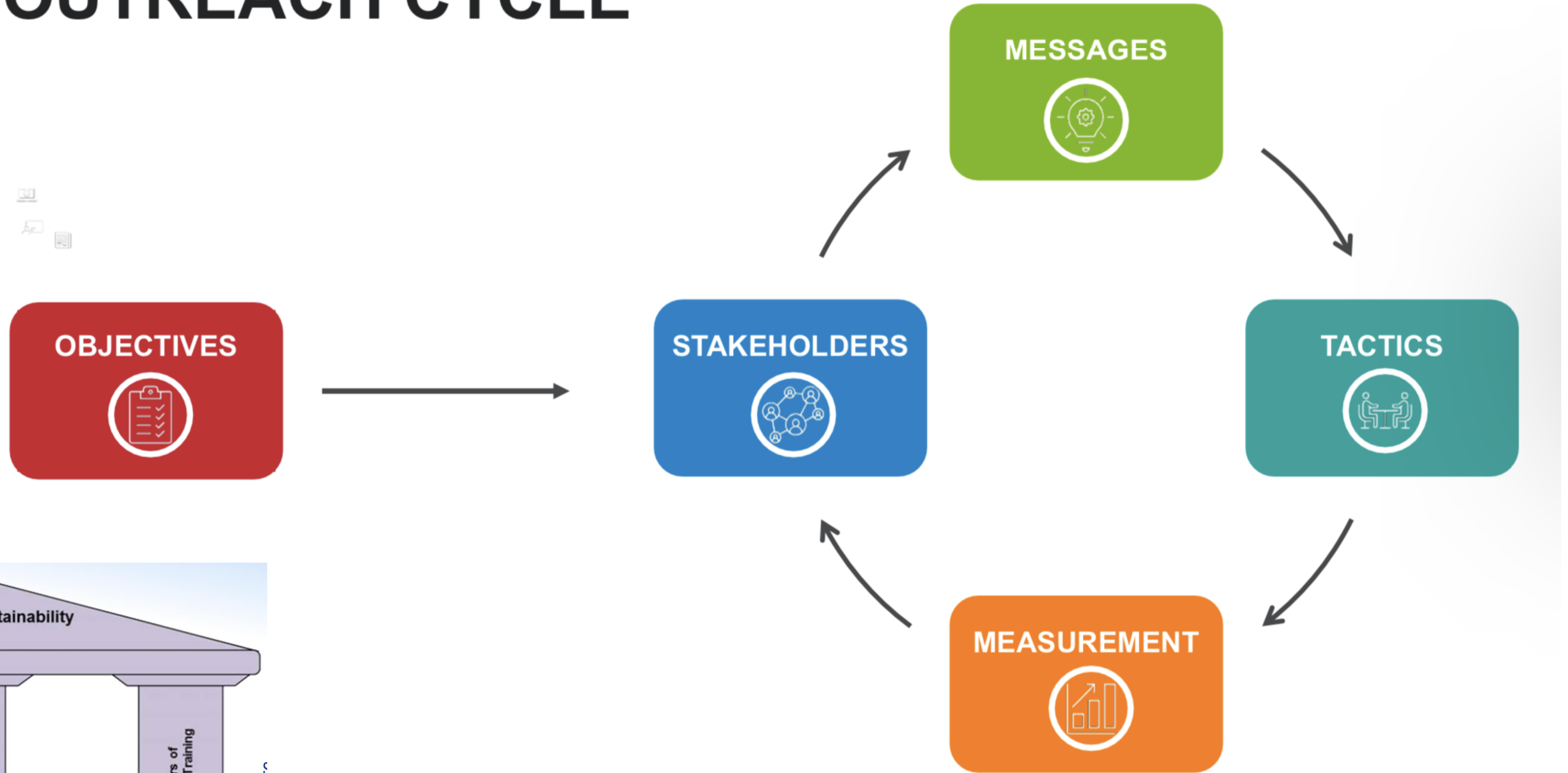
While governments and regulatory bodies are still important, a Business Plan focuses mostly on the financial and social implications of a few parties, namely

- Consumers of the product (customers)
- Alternate sources of supply (competitors)
- Staff (recruiting, training and compensation)
- The Community (site location and public relations)
- Shareholders/ Investors (sources of Finance)

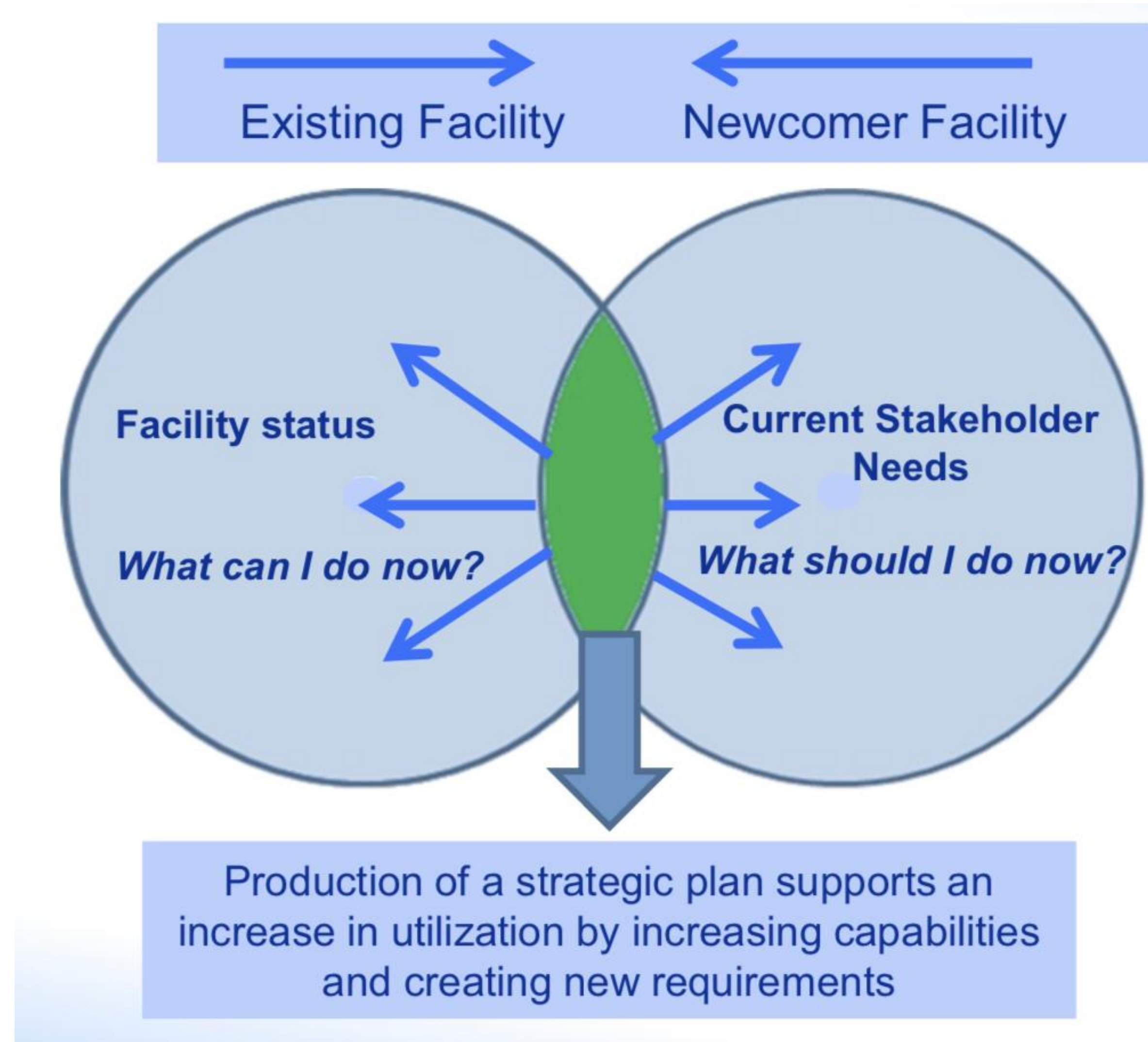
Changing the institutional mind-set and culture from the traditional R&D oriented towards customer and business oriented.



OUTREACH CYCLE

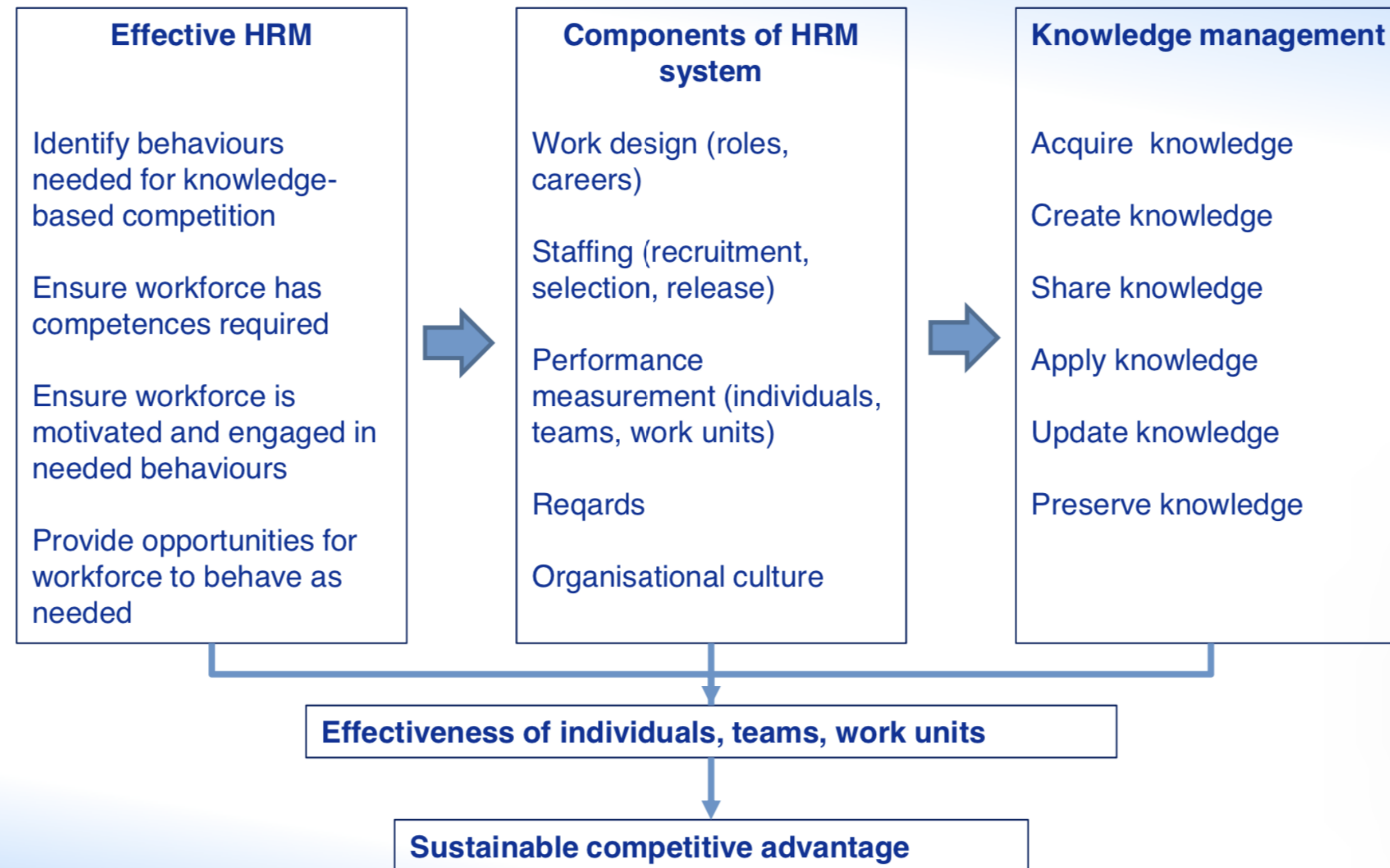


Different approaches between an existing or a new facility



Nuno Pessoa Barradas and Danas Ridikas, Argonne Workshop for Young leaders, 2021, RLA0069

Human Resource Management & Development



Managing Human Resources for Knowledge-Based Competition, New Research Directions. S.E. Jackson, M.A.Hitt, A.S.DeNisi (Eds.) Jossey-Bass, San Francisco, 2003,



The importance of Marketing

The Marketing 4 Ps as a framework for success:

Product → Offer specific Niche Applications

Price → Conduct Competitive Analysis

Path → Extend reach with Partnerships

Promotion → Outreach to the User Community

Estimate your costs

Price \neq costs

Price = negotiation

Price depends on the need

Price $>$ costs : if you know there is a market

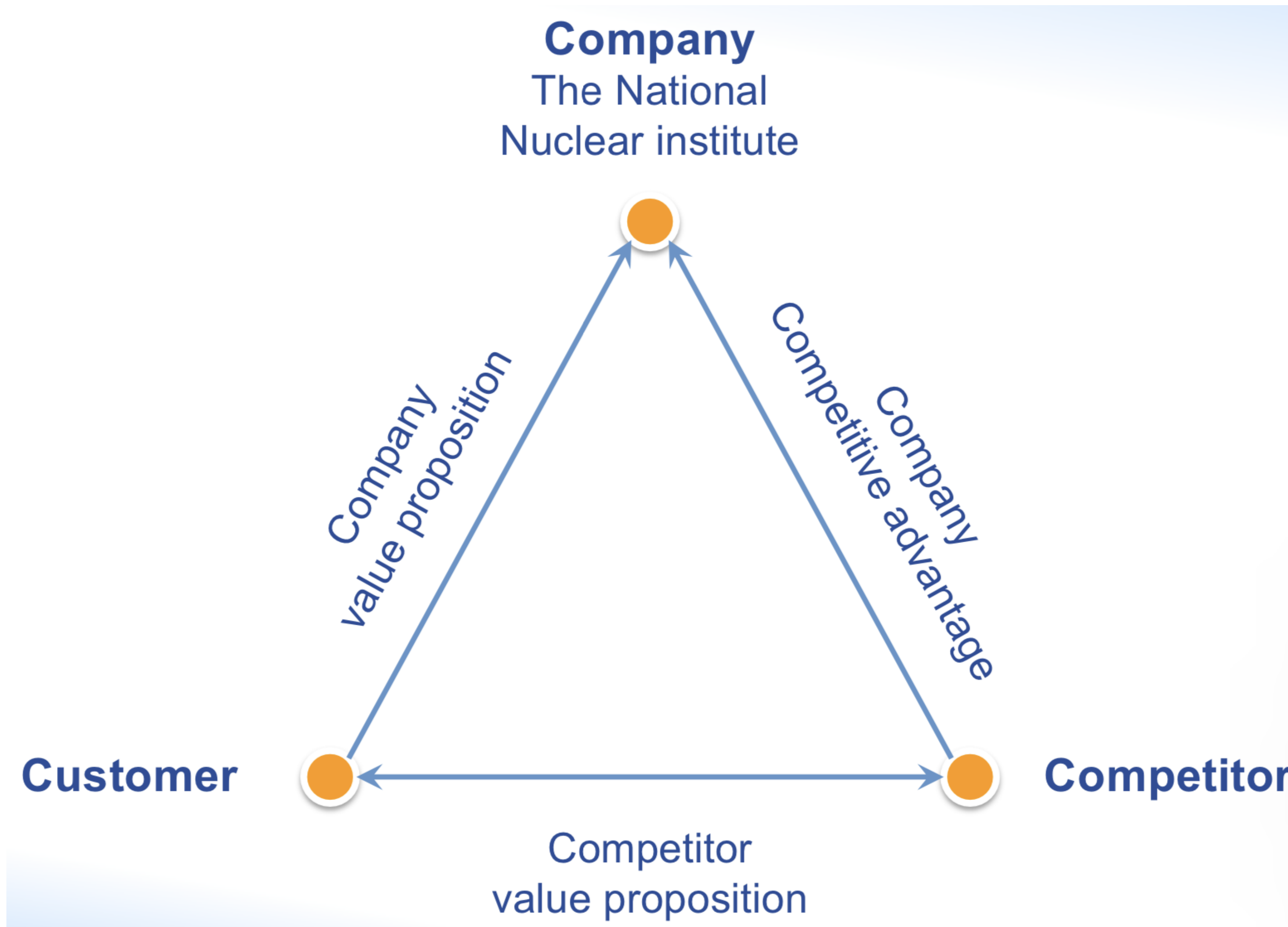
Price $<$ costs : if you want to penetrate the market, if future opportunities (e.g., long-lasting contracts) are expected...

Cheap \equiv not credible, unreliable

Brian Monaghan, RLA0069



The Marketing Environment



Brian Monaghan, RLA0069



Programmes with stakeholders relieves NNIs from nearly exclusive dependence on government funding. It transforms the NNIs' innovative potential to contribution to the national socio-economic development.

Revenues by NNIs often do not cover the operating expenses. Governmental funding will continue to be an important component of the budget of many NNIs for

- Regular operation
- Renovation and refurbishment of existing facilities
- Major equipment
- Development of new capabilities.

Continued strong governmental commitment to support the development and utilization of nuclear science and its applications is indispensable for sustainability of national nuclear institutions.

Financial support Supplements to the main finance by the government can easily be explained as 'money makers', resulting in an excuse to governments for reducing the regular budget.

Peter Bode, RLA0069



The importance of the Supply Chain in unstable contexts

To assure the Supply Chain sustainability is a key element on the operation of the facility

It represents the Management of a network of multiple businesses and both, intra and inter company relationships.

The Supply Chain mechanism should be controlled and supervised to maximize the product availability to the customer



Risk management

Categories of Risks (type 1)

- Technical Risks
 - Risks related with the development of technologies or systems
- Social and Political Risks
 - Risks related with public acceptance or environmental issues; political stability
- Financial Risk
 - Financial issues which may occur during the project period and the operation

Categories of Risks (type 2)

- Internal (depending on project itself, easier to manage)
 - Most of the technical risks, related with the development of technologies or systems
- External (depending on external stakeholders, difficult to manage)
 - Risks related with public acceptance, political stability, continuous government support

Risk analysis and response

- Risk classification: Degree of risk = (Likelihood) x (Impact)
- Risk response/mitigation strategy

Risk event	Risk Probability	Risk Impact	Risk assessment
This will happen	H	H	VERY H
	H	M	H
	H	L	M
This may happen	M	H	H
	M	M	M
	M	L	L
This will probably not happen	L	H	M
	L	M	L
	L	L	VERY L

Peter Bode, RLA0069



Intangible Benefits

“considering the diversity in motivation, ownership arrangements, and organizational interest in investing in an IRF, one may have to consider intangible externalities that would accrue over relatively long timescales, for example education and health benefits to the general public. In that case, financial evaluations and assessments based only on easily quantified expenditures, income and depreciation of tangible assets may not be sufficient. Consequently, the feasibility of an IRF project cannot be best assessed purely on the basis of simple financial matrices and projections that do not take into account the larger benefits to academia, public health, society, or trade exports. Rather, the broader potential social, technological and economic benefits need to be evaluated.”

Guidelines for the establishment of IRF

But still we should be capable to measure it and to materialize stakeholders support to strengthen facility sustainability



Some of the activities developed within RLA 0069

- Focused training on young leaders, including particular focus on communication and gender balance promotion.
- Training on and supply of UNIDO's Computer Model for Feasibility Analysis and Reporting (COMFAR) includes cost–benefit and value-added methods of economic analysis and has been extensively employed to facilitate short- and long-term analysis of financial and economic consequences for both industrial and non-industrial projects.
- Over 15 Workshops with Argonne, IAEA and Regional workshops
- Development of Executive Summaries of Business Plans with their corresponding evaluation.
- Continuation of the work in a focused manner, with external assistance, at the national level, with those countries that showed specific interest in continuing with the work.



Some examples from the regional Case Studies

SWOT ANALYSIS

THREATS

- Not assurance to get the complementary budget to implement the last stage of the project, due to the reduction of the state budget.
- Difficulty understanding with the regulatory authority.
- Natural disaster that could affect the territory due to being located in a tropical region.

OPPORTUNITIES

- Become a regional training center.
- Academic institution that could offer careers in different nuclear technology and applications related fields.

SWOT ANALYSIS

STRENGTHS

- High trained human resource in different areas.
- Important network of contacts with different international centers
- Capabilities to produce radioisotopes with existing facilities
- The Facility is strategically located for radiopharmaceutical distribution to the different nuclear medicine centers.
- Highly motivated young staff for challenge of the future.

WEAKNESSES

- Excessive bureaucracy on purchasing processes due to governmental regulatory procedures.

SWOT

Internal analysis	<ol style="list-style-type: none"> Validated control systems Public installation → low prices compared to private companies External subsidy for training and procurement 50 years of operating experience Highly trained staff 	<ol style="list-style-type: none"> Small staff and 50% are older than 60 years Static transport system → waste of irradiation time Limited Budget Inability to meet the industry demand for irradiation
External analysis	<ol style="list-style-type: none"> It is a reference plant for enquiries from regulatory agencies Participate in the issuance of regulations Increase the number of hours of irradiation by adding a mobile transportation system Get young human resources in training courses Achieve to be Self-sustaining 	<ol style="list-style-type: none"> Salaries in private plants are usually higher Decreased investment by the government By not being able to cover the demand of the companies to sterilize the products, there is a loss of customers who irradiate in private plants

Competitors

	Private company irradiation services	World leader in integral solutions for industrial sterilization	Gamma Irradiation Plant
Customer awareness	Excellent	Excellent	Excellent
Technology	Gamma irradiation	eBeam	Gamma Irradiation
Dose uniformity	Good	Good	Excellent
Technical assistance	Low	Good	High
Selling staff	Medium, annual contracts with fruit growers and packers	High, personal contact and via internet	Low, only personal contact
Price	Medium	High	Low



Some Preliminary Conclusions

- The importance of planning research and commercial uses complementarity.
- Sustainability must be part of the project from the planning itself.
- Equipment donation presents a situation that must be carefully managed. (The role of the IAEA is key, but financing alternatives are lacking)
- Costs covered by third parties or the organization to which you belong must be considered in the cost-benefit analysis
- Stakeholders or Customers must be adequately measured and not remain at a conceptual level.
- Difference between being a small Institution or being part of a large one (costs covered, influence on decision-making)
- The difference in regional infrastructure affects the possibility of regionalizing services
- Infrastructure weakness at the national level
- Credit availability may depend on alternative technologies



Some Preliminary Conclusions cont.

- Technical staff end up having greater responsibilities and beyond their technical capacity
- Difficulties to retain qualified staff and to pay them accordingly
- Public and private sector tend to compete rather than to cooperate.
- Distortion of public subsidies: Activities and products are subsidized that would not be in a position to require being subsidized.
- The need to define and measure the strategic conditions of the Project/facilities in order to strengthen its sustainability
- Budget difficulties cause facilities to be underutilized
- In many cases, the decision to build a facility was made as a result of an opportunity that presented itself, without prior planning.
- Budgetary difficulties and weakness due to excessive dependence on public funds become more noticeable when need to expand the facilities.
- If needs linked to the Sustainable Development Goals are really being addressed, the different actors with responsibility in the matter should be directly involved, strengthening the sustainability of the project.
- Challenge to go from Market fixing to market creating



Thank you

Acknowledgements

Brian Monaghan, Peter Bode, Celina Horak, Nuno Pessoa Barradas, Danas Ridikas, Raquel Scamilla, José Pachado, Verónica Vogt, Guillermo Ferenaz, Paul Murphy

INTERNATIONAL CONFERENCE ON

ACCELERATORS FOR RESEARCH AND SUSTAINABLE DEVELOPMENT

From good practices towards socioeconomic impact



23–27 May 2022

IAEA Headquarters, Vienna, Austria