Publications for Public Evaluation:
Deliverable 2.3 and the Concept of Strategic

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Proposal Acronym: TARGET
Proposal Full Title: *TARGETED R&D POLICY*
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DELIVERABLE 2.3

A set of benchmarks that will be studied in the participating countries

A. Introduction

In order for the research team to prepare for the second phase of the project, namely the evaluation of the consortium countries, several cases have been studied. Both desk and field research was prepared for the following cases: The case of Singapore, the case of Scotland (and Cambridge, UK), the case of North Carolina and the case of Sweden-Denmark (Medicon Valley).

Upon completion, the research team gathered for a 3-day workshop in Santiago de Compostela, Spain to discuss the findings and to decide on the benchmarks that will be studied in the upcoming phase. The main objective of the meeting was to decide on indicators for successful targeting. Though, a preliminary task was to redefine what is meant by 'targeting' in the context of this specific project. We will address both issues below.

B. 'Targeting' in the Context of TARGET Project:

According to the Oxford Dictionary, 'Target' stands for:

- **Noun 1** a person, object, or place selected as the aim of an attack. **2** a board marked with concentric circles, aimed at in archery or shooting. **3** an objective or result towards which efforts are directed: *a sales target.*

In terms of Industrial Economics, Targeted Policies, in line with explanation no.3, refers to policies that are aimed at achieving specific outputs or that are designed with specific inputs in mind.

However, for the sake of the project, by *targeting* we would like to indicate a policy process referring to the complexity of the object being targeted and the subsequent

measures required to achieve it as opposed to the implementation of a single policy measure which is not the result of such a process. Thus, in our view *targeted* policies refer to processes that are part of ***Strategic Road-Mapping.*** In addition, *targeting,* in this respect, will refer to efforts that are directed at objectives that are not fully characterized in terms of the technology involved and the sectors that need to be addressed, therefore, a road-map for achieving such objectives isn't clear. Consequently, planning must be based upon assumptions, on-going learning (as well as learning by doing), and frequent evaluations that dictates a dynamic process. Under such conditions, coordination between the different agents is highly important and a *strategic road-map* would better serve a country trying to target objectives such as Nanotechnology, Clean-tech, Biotechnology, and the like. Thus the term *strategic targeting* could even be replaced by the term *strategic road mapping* as a term best describing the policy process under focus.

Every country trying to promote growth and innovation is guided by a strategy, either an explicit or an implicit one. This strategy can be implemented by following an explicit Strategic Road-Map (designed at the policy-maker level) or it could be implicitly implemented through activities of various agents (be it market or public/governmental agents), which retrospectively might seem highly coordinated. For instance, Cambridge, UK, could be characterized as a case where market and public agents played a significant role not only in the decision to target the Biotech sector but also in implementing this strategy though no road map was explicitly designed, whereas in North Carolina, the process was explicitly planned by the various agents..

We are aware of case-studies where a successful targeting process was conducted *without a strategic road-map.* Nonetheless, from a policy-making perspective, the interesting challenge would be the management of such a process rather than its evolutionary progress. Therefore, for the purpose of TARGET project, we would like to concentrate on *policy formulation processes* that will assist policy makers to develop a strategic road-map. Such a road-map will aim, under budgetary constraints and available capabilities (background and pre-conditions), to advance the country towards the targeted objective in the most timely and cost-effective manner. Without an explicit road-map, different market agents as well as public and government agencies might pursue approaches dictates by their professional/political/economical interests all aimed at a single objective. However, though the sum of these fragmented efforts may result in great success they are certainly not manageable and will not necessarily lead to the best targeting process. Clearly, one model of *strategic road mapping* could be relatively narrow (vague) leaving a wide room for different agencies to influence the implementation process and the design of specific tools while another model could describe a very detailed strategic road map that specifies, in advanced, all the policies that should be used. One aim of our project is to test such different models in order to define which model should be implemented in different cases.

C. Strategic Road-Mapping

One of the most important aspects of Strategic Road-Mapping as opposed to central planning, as we see it, is that the objective being targeted, for instance Biotechnology is not completely defined in terms of the specific policy tools that should be implemented. At time T=0, when the road-map is being developed for the first-time, it is not yet understood what would be the best way to address the challenge. This is why "simple" planning is not possible. In cases where the needed actions and fields of interventions are perceived as well known central planning may suffice. Since in TARGET project we are dealing with Biotechnology, a field characterized by yet unclear development paths, Strategic Road-Mapping would serve us better as a theoretical framework.
It is important to note the concept of strategic road mapping is suggested as an ideal. It is probably that cases where strategic road mapping was explicitly conducted are rare or even not in existence. However, this concept emphasizes the need to take a multi-dimensional perspective while creating learning mechanisms that will allow the identification of different market imperfections (and failures) and the formation of appropriate tools to overcome them.

In such scenarios where the *road* which leads to the desired objective that is being targeted isn't clear at T=0 the conceptualization of the challenge must always be a *multidimensional* one. In other words, the policy-maker must think about different dimensions of intervention such as: the dimension of the industry (e.g. supporting R&D activities), the knowledge base (e.g. supporting universities and research institutions), aspects of regulation, finance supply (e.g. supporting VC), etc. Figure 1 describes potential set of elements that need to be considered at the conceptualization phase and that will take the form of the first level of the Road-Map, namely T=0:

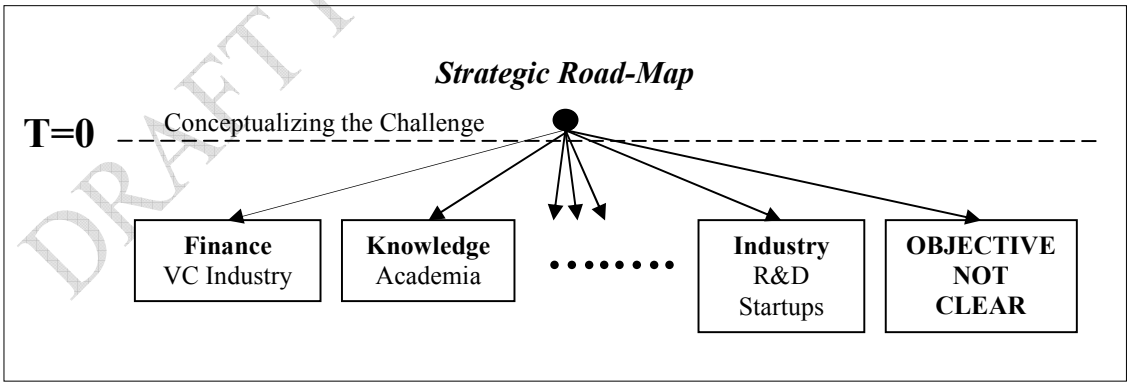

Figure 1. First Level of the Strategic Road-Map: Multidimensional

As can be seen in Figure 1, unclear objectives (e.g. regulation or property rights) should also be included in the road-map from T=0 *since they might be critical to the targeting*

process. The entity that is responsible for the road-map should decide on the entry-points i.e. in which elements (e.g. Academia, VC, R&D etc.) there is a need for intervention and how to prioritize the intervention. Budgetary constraints, as well as other factors (such as existing infrastructure, political or ethical pressures) may dictate the need for prioritization. Thus, a deep analysis of the critical elements that need to be triggered first (entry-points) must be conducted.

The specific moment in time when a country decides to pursue an objective will constitute as *that country's* T=0; for each objective and each country their own T=0. The timeline is *subjective* and describes the perspective of a policy-maker who faces for instance the challenge of Biotechnology. Such a policy-maker should think of himself as situated at the first moment of policy formulation, the moment of conceptualization of the challenge. It well may be that his country have taken measures to support Biotechnology in the past, but from a policy-making perspective he should consider the formulation of the Strategic Road-Map as T=0. This means that when thinking about implementation at T=1, T=2, etc, the policy maker should take into account its country's concrete position, namely its capabilities and current advancement in each of the dimensions. This consideration will affect prioritization of entry-points.

Once the challenge has been conceptualized, implementation should be considered. Assessing what are the key points of the country ("pre-conditions") and where support is needed will help decide on the specific form of implementation. For instance, country A that already has good science may prefer to devote its funds towards the development of start-ups (by for e.g. developing its technology transfer system) while country B that has a weak knowledge-base in the field might decide to focus on its creation. At time T=1 implementation begins – different implementation for different countries - *based on the*

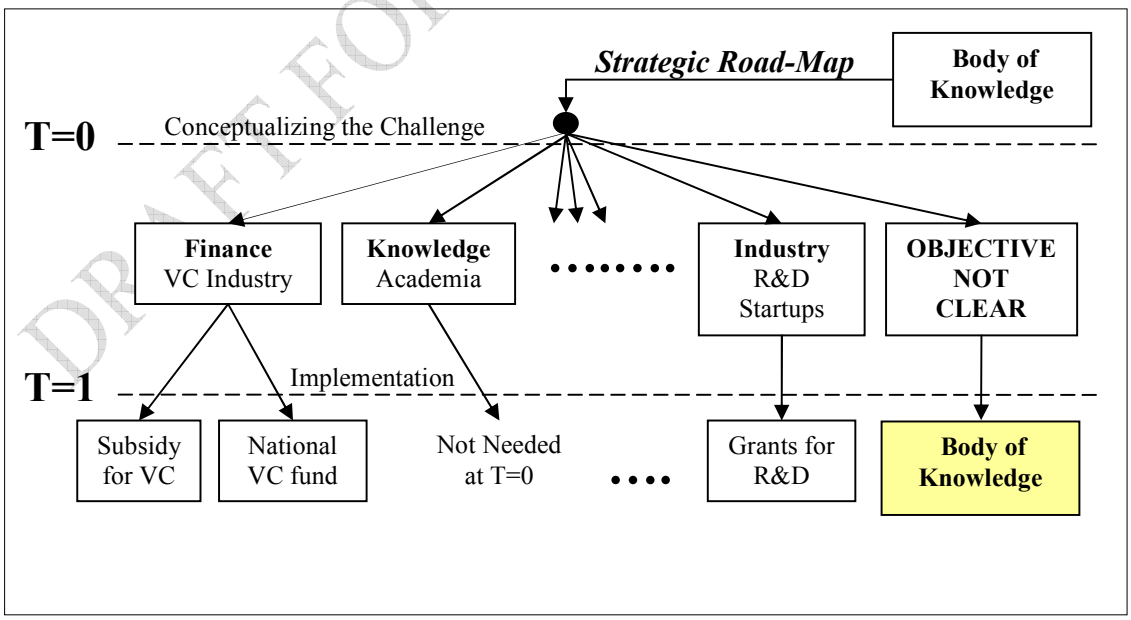

Figure 2. Second Level of the Strategic Road-Map: Implementation

entry-points that where characterized at T=0. This is shown in Figure 2.

Whereas some policies should be decided at T=0, others which are less known in terms of their importance continue to be considered by the body of knowledge and may/or may not be decided at later stages (e.g. T=3). Moreover, an ideal scenario would be one where

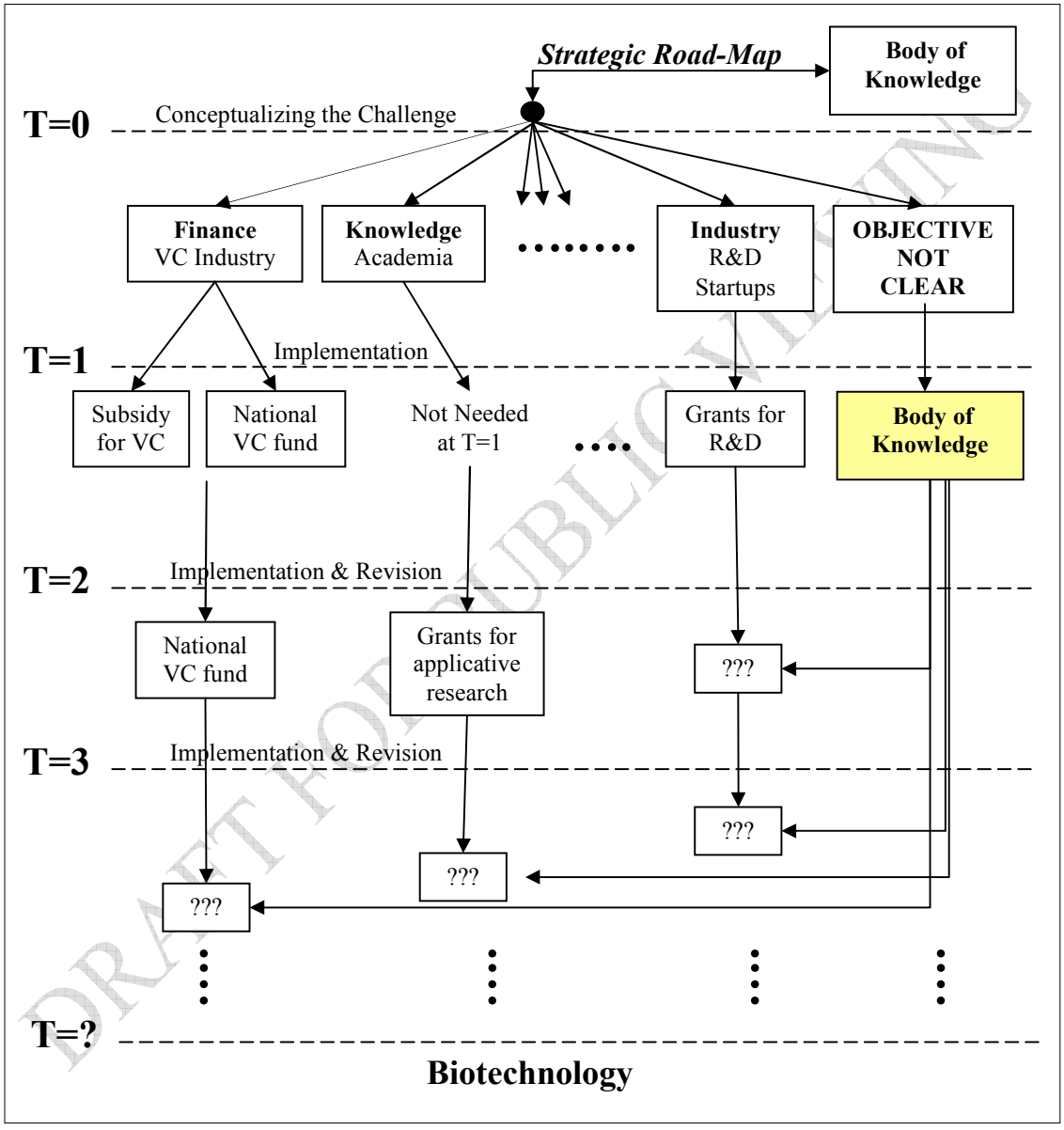

Figure 3. A Complete Strategic Road-Map *as seen in T=0*

a Body of Knowledge (see below) exists at T=0 and takes part in the design of the Road-Map. However, if such a function does not exist, the creation of a Body of Knowledge must be part of the implementation process.

Figure 3 provide an example for a possible road map designed at T=0. In this example, the policy required for strengthening the industry at T=2 is yet not clear (though it is clear at T=1). This might be a result of uncertainties regarding the response of the industry to the policy implemented at T=1 as well as the other factors affecting the industry, cannot be deterministically defined at this point in time. A more detailed explanation for this example is given at the Annex.

For such reasons, the existence of a body of knowledge at T=0 is essential.

The Body of Knowledge

Because the nature and the process of Targeting the specific objective is still unclear, an ongoing evaluation and a continued learning process must follows all levels of drawing the Road-Map and its implementation. This body of knowledge (BoK) is responsible for 'filling in the question marks in the road-map' as time unfolds. The BoK could take several forms of organization. It can be based on existing private/public/governmental bodies or it can be formed especially to fulfill this task. It can be based on a formal secretariat or it can be in the form of advisory committee. Whatever form the BoK will take it must consist of people being able to collect and assess information which is generated by different stakeholders or being generated by experts. The BoK should be able to translate this information into a road map and to create the drive for such a road map to be implemented. Additionally, the BoK should be responsible for monitoring progress, ensuring an on-going learning, enabling feedback from different stakeholders and constructing policy that will deal with the missing parts (marked with "?") of the Road-Map as information becomes available.

D. Benchmarks to be Studied at the Participating Countries

In light of the above discussion, the following benchmarks were selected. Analyzing these benchmarks in each country will help the research team evaluate whether a Targeted process was conducted. This means, as mentioned above, the creation of a Strategic Road-Map or a similar plan that could be characterized as filling the same function of coordination, planning, learning and long-term foresight.

1. <u>An official decision to target Biotechnology:</u>

Such a decision could be taken by any entity or body that has official recognition (a ministry, a committee or even a private organization that represents the field). A decision will be regarded as 'serious' if *specific attention is devoted* to biotechnology following the official statement. This may include dedicated budgeting, additional manpower, implementing specific grants or programs, etc.

The decision to target should be evaluated according to the following:

1. **Extent of Definition**: A 'good' decision would describe what biotechnology includes. Does it include Medical Devices? Does it refer to pure biotech alone? etc. A vague definition may contradict the concept of Targeting.
2. **Multidimensional Conceptualization**: It is expected that the conceptualization of the challenge will be a multidimensional and include different paths of advancement. This is especially true in areas with high level of uncertainty. A "decision" should refer to the different dimensions even if no actual interventions are required. Actual implementation could be mono-dimensional as a result of budgetary or other constraints; however the challenge should be envisaged as a multidimensional one.
3. **Planning Horizon**: A 'good' decision would address the duration of the effort. Is the country targeting biotechnology for next 3-years? 5-years? Additionally, what happens at the end of the decided period and how the efforts will be evaluated should also be addressed from the very starting point.
4. **Objective and Rational**: Two core questions should be answered from the outset: What is the objective of targeting biotechnology? (e.g. creating jobs, advancing a knowledge economy, etc.) and Why was biotechnology selected for this objective? (e.g. the country has excellent science base).

2. Pre-Implementation Analysis:

Once a decision was made, an analysis should be carried out. The existence of an ex-ante analysis is the second major benchmark. As mentioned, developing capabilities for the emergence of a biotechnology industry is a complex challenge. A decision that is not succeeded by a thorough analysis prior to implementation will not be regarded as one that fits the scope of the challenge at hand.

A 'good' analysis should emphasis on the following:

1. **Analyzing the pre-conditions:** Addressing both the prevailing pre-conditions in the country as well as the pre-conditions that played a role in the emergence of similar industries around the world.
2. **Learning of minimal conditions:** Minimal conditions include conditions that must exist in order of the effort to be productive, e.g. the existence of universities that conduct research in the field. This stage consists of learning about the minimal conditions necessary for biotechnology and mapping the country's position in regards to their existence.
3. **Indentifying the Body of Knowledge:** It is unlikely that a single entity will fill the position of the BoK. However, an initial step will be the identification of the entities that are in position to fill the function of designing a Strategic Road-Map – that is entities that have knowledge relevant to challenge and/or

the capabilities to initiate such a process. This could include national councils, ministries, industrial organizations, etc.

3. **Budgeting:**

A clear reference to budgeting should accompany the decision to target. It doesn't have to be a part of the decision, but a reference should be made nonetheless.

In terms of budgeting, the following should be considered:

1. **Additional Budgeting vs. Inter-budget allocation**: Is the effort towards biotechnology budgeted separately and on top of existing operations or is the effort should be financed under the existing budgeting constraints?
2. **Dynamic Budgeting**: The unclear nature of the process can lean to unknown budgetary requirements during the implementation phase, before the budgeting period is over. Thus, a section of the budget should remain flexible so unknown issues could be addressed (The "???" sections in Figure 3, for example).

4. **Implementation:**

The following benchmarks will indicate whether implementing the different policies is done in accordance with the concept of Strategic Road-Mapping:

1. **Defining Entry-Points:** A Road-Map should indicate the entry-point for policy. Once the conceptualization of the challenge is complete and the different dimensions are mapped, a decision should be made as to the dimensions that will be addressed. The decision could be influenced by budgetary concerns, political agendas, the state of development in the country, etc.
2. **Minimal Conditions as Entry-Points:** As described, without the minimal conditions, the effort towards biotechnology will not be efficient. Thus, if one or more minimal conditions are lacking they should become the entry-points. If, for instance, a knowledge base is not in existence, selection Venture Capital as an entry-point will be wrong.
3. **Fulfillment of the function of the BoK:** If a BoK was not established or identified at the stage of conceptualization, it is important that such a body will be defined at the first implementation stage. Again, this could be a combination of several entities that work together and function as the learning body which evaluate progress and design the next stages. The BoK must be able to work in a multi-agent environment (e.g. to interact with both public and private bodies of different levels) in order to enable the multi-dimensional approach.

4. **Evaluation Procedures:** The BoK should also conduct evaluations. When the challenge is not clear, as with biotechnology, evaluation *should become an integral part of implementation*. Known procedures of evaluation should accompany the ongoing implementation of the policy. This will encourage and support learning and help the BoK better understand what the next phases of development should look like.

Annex:

To make our approach more clear, we will now describe the different dimensions that are being addresses in the case above and how they unfold as described in the Road-Map:

The Finance Dimension: At T=0 it is clear that funds should be allocated to this dimensions. Possibly, a VC industry has yet to emerge and there's an understanding that contributing to the emergence of VC is important. Thus, at T=0, a decision is made to offer two support mechanisms at T=1: offering subsidy for VC firms and establishing a national fund that will offer VC finance. It is also understood *at T=0* that offering subsidy for VC firms will no longer be needed at T=2 and only the 'national VC fund' will continue to be supported.

The Knowledge Dimension: In the above case, the science base in the country is world-class and a decision was made to allocate funds to other dimensions. At T=1 there will be no tool implemented for the purpose of supporting science. However, it is assumed *at T=0* that support for applicative research will be needed at T=2 in order to exploit the knowledge generated in the academic institutions. As can be seen this is reflected in the road map.

The Industry Dimension: At T=0 it has been decided to support R&D in firms, but *not* to support start-ups companies because VCs are not yet present. Additionally, it is understood at T=0 that the best tool to implement at T=2 is not yet known (whether it will be pre-competitive research, collaborative programs or international schemes). It is the responsibly for the body of knowledge to provide additional information and to supplement the Road-Map as T=2 approaches.

The Strategic Road-Map can also make it easier to understand whether the available funds are sufficient for taking on the challenge. In the case detailed above, the country is targeting biotechnology. For the sake of the argument, let's assume that it has X million dollars allocated for this purpose. The fact that at T=2, there's an intervention process that is yet to be understood means that the issue of funding is crucial: when T=2 arrives, it is possible that policies aimed at answering the required needs will remain outside of the available budget. The issue of funding should be addressed generally, as additional funds are required for T=3, T=4, etc. It is not clear when T=? arrives; thus the process of adding more funds is to be recognized by the relevant stakeholders.