

## Article

# Addressing Goal Conflicts: New Policy Mixes for Commercial Land Use Management

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**Abstract:** Commercial land use management that focuses on a future-oriented urban and regional development must address multiple goals. Effective policy mixes need to simultaneously (1) improve city-regional and inter-municipal cooperation, (2) reduce land take, and (3) assure the long-term economic development of a region. Using the Northern Black Forest in Germany as a case study, we brought together planning and land use research with public policy analysis. We applied cross-impact balances (CIB) to build and analyze a participatory policy-interaction model. Together with a group of 12 experts, we selected effective individual measures to reach each of the three goals and analyzed their interactions. We then assessed the current policy mix and designed alternative policy mixes. The results demonstrate that current approaches to commercial land use management present internal contradictions and generate only little synergies. Implementing innovative measures on a stand-alone basis runs the risk of not being sufficiently effective. In particular, the current practice of competing for *municipal* marketing and planning of commercial sites has inhibiting effects. We identified alternative policy mixes that achieve all three goals, avoid trade-offs, and generate significant synergy effects. Our results point towards a more coherent and sustainable city-regional (commercial) land-use governance.

**Keywords:** commercial area; land use governance; city-regional governance; goal conflict; cross-impact balances CIB; policy mix; policy design; policy coherence; urban and regional development

## 1. Introduction

Reducing land take in urbanized areas and preserving open spaces and conservation land are necessary to preserve the soils with their diverse functions [1]. Land-saving urban development has, therefore, become a guiding principle in several countries around the world, including Germany. However, land is still required for housing and the expansion of infrastructure, as well as for commercial development and renewable energies. At the same time, competition between different land uses is increasing [2]. For decades, the central strategic approach to sustainable land management has been the idea of urban densification and intensification [3], widely recommended by environmental agencies [4,5]. For commercial land management, the redevelopment of brownfield land is a significant concept of growth management and planning [6–8]. Moreover, concepts for multi-story or multifunctional construction in commercial areas also exist [9,10].

In addition to urban densification, inter-municipal or even regional cooperation is recommended by environmental authorities as well as the scientific community with regard to commercial land development. Inter-municipal cooperation is expected to generate economic, social, and ecological benefits [11–13], as well as synergies between municipal partners and moving land-use planning to a more regional level [14–16]. In policy and strategy papers in Germany [10,17], inter-municipal cooperation in land management is often expected to support efficient land use and reduce land take [18]. However, such causality still needs to be empirically proven. Empirically, commercial areas in Germany are still mostly planned and managed in municipal competition [19], and innovative planning processes as well as land- and resource-efficient construction concepts are rarely implemented. In summary, we are confronted with a well-known but persistent issue.

In the following, we briefly outline the reason behind (a) a goal conflict between economic development and reduction in land take and (b) the rarely realized expectation of inter-municipal cooperation to support both goals. First, there is an inherent conflict between economic growth on the one hand and more efficient use of resources, including land, on the other hand. By means of different regulatory and financial control instruments, various environmental policy areas were successful in internalizing the previously externalized negative effects of a growth-oriented economy [20]. However, despite the ideas of a post-growth economy [21] or degrowth [22], companies follow the logic of profit maximization, and the state at all levels is dependent on tax revenues, which particularly applies to local governments in Germany. Therefore, environmental policies are challenged by the need for job and business development and municipal tax revenue generation [23].

Second, inter-municipal, or even regional cooperation in commercial land management, is expected to address this conflict: inter-municipally managed commercial sites are expected to be larger, more professional, and more attractive to businesses than smaller, dispersed, municipal developments. Smaller municipalities, in particular, believe themselves to be in a better position to attract companies and new residents from outside by cooperating in the management of commercial areas and thus realizing larger, more attractive locations [24]. Larger centers often lack suitable land in their jurisdiction. Furthermore, economies of scale are expected through shared infrastructures and development costs [25]. Simultaneously, larger commercial areas operated in inter-municipal cooperation help prevent urban sprawl. Cooperation also counteracts the problem that small municipalities designate and develop too much commercial land, often in poor locations, for which there is no need in reality. In particular, municipalities with poor economic performance tend to develop more commercial areas to attract businesses and industry than the demand requires, thus, wasting land resources [26].

Nevertheless, inter-municipal or even regional cooperation in commercial land management is rare. Reasons include the municipal planning sovereignty in Germany [27] and municipal dependence on business tax revenue [28], leading to competition between municipalities with regard to industrial location [29] and few incentives for cooperation. Although attempts are often made to do so, the cooperation partners are often unable to agree on the legal form to be chosen for the cooperation, voting rights, and cost–benefit

distribution that are perceived as fair for all parties involved [19]. Cooperation between cities and their smaller surrounding municipalities is, in addition, hindered by the contrasts in size, interests, and power of the unequal partners [30]. Therefore, cooperation, especially between urban and suburban or rural municipalities, is often conflictive and inhibits sustainable land management [31].

Beginning with the diagnosis of these fundamental tensions and contradictions, our analysis assumes that there are (at least) three fundamental goals that the management of commercial land must address in the future:

- Goal I: Improve inter-municipal, in particular, city-regional, cooperation regarding commercial areas;
- Goal II: Reduce land take for commercial use;
- Goal III: Ensure a future-oriented (i.e., long-term) economic development.

Clearly, this is a simplification, as in different contexts, other goals may be prioritized (e.g., in cases where land is still easily available or in the case of municipalities focusing on housing and tourism). Moreover, even if goals I–III are prioritized, other development goals may also play a role, and this makes the interlinkages, trade-offs, and potential for synergy more complex. Indeed, multiple goals and goal conflicts were recognized as a central challenge for sustainable development. This is currently discussed regarding the 17 Sustainable Development Goals (SDGs)—with 8–12 targets each—of the United Nations Agenda 2030 [32]; see [33] for an overview of SDG interaction research. Policy coherence, i.e., coherence between policies from different sectors and across scales, has been recognized as a key requirement for sustainability transformations [34–37] and formulated in SDG Target 17.14 [32]. A growing body of the literature is using policy coherence for sustainable development (PCSD) as a framework to understand trade-offs and develop new policy methodologies fostering sustainability transformations [37,38]. Striving for synergy and avoiding trade-offs is crucial [39,40]. Land use governance research proposed typologies of common interactions between instruments during different phases of the policy cycle [41]. While goal conflicts have been widely recognized as hindrances to more regional and more sustainable commercial area planning and governance [17], policy combinations regarding commercial areas and their coherence have, to the best of our knowledge, not been considered yet.

Research on policy combinations has been performed in various fields, such as development policy [38], innovation policy [42–44], and mobility policy [45–47]. It analyzes interactions, goal conflicts, temporal logics of (old and newly implemented) strategies, and measures and policy instruments within or between policy fields and between levels of governance. The literature illustrates that consistent bundles of measures are rare. In contrast, a policy patching of different measures is frequently observed, which is often inconsistent in their interactions [48,49]. Public policy analysis provides a rich body of literature on policy mixes [42,50,51], i.e., combinations of policies (tools, instruments, and measures) and their interaction. The main hypothesis that we can draw from the literature is that policies must be considered in their interplay; focusing on individual approaches neglects the interplay of new and old policies as well as policies within and between sectors and on different scales (e.g., municipal, inter-municipal, regional, state). Combinations require to be considered to avoid trade-offs and generate synergies. Regarding commercial areas of the future, lists of individual policies for different governance levels in Germany have been developed [10]; however, we lack a systematic analysis of their interplay and the effects of their combination. Such analysis is required to design approaches for a more coherent (and more sustainable) regional governance of commercial land use. We consider this as the central research gap addressed by this study.

In order to systematically analyze the interplay between policies to reach multiple goals, a new approach was recently developed [52] that uses a qualitative but systematic form of systems analysis, cross-impact balances (CIB) [53]. This approach allows the evaluation of status quo policy-mixes *ex post*, designing of alternative policy mixes, and their *ex ante* evaluation regarding their internal consistency and degree of synergy. This

approach was developed in the field of water management, and its transferability to other fields was argued [52]. However, this transfer has not been empirically tested, and hence, it is the secondary research gap addressed by this study.

The following sections aim to respond to the two research gaps identified above. We ask the following questions: How to combine policies to improve city-regional cooperation, reduce commercial land take and assure the economic performance of a region at the same time? How do policy mixes appear in which policies interfere with or contradict each other as little as possible in their effectiveness and realize as many synergies as possible? Which policy mixes can achieve the three goals equally and jointly?

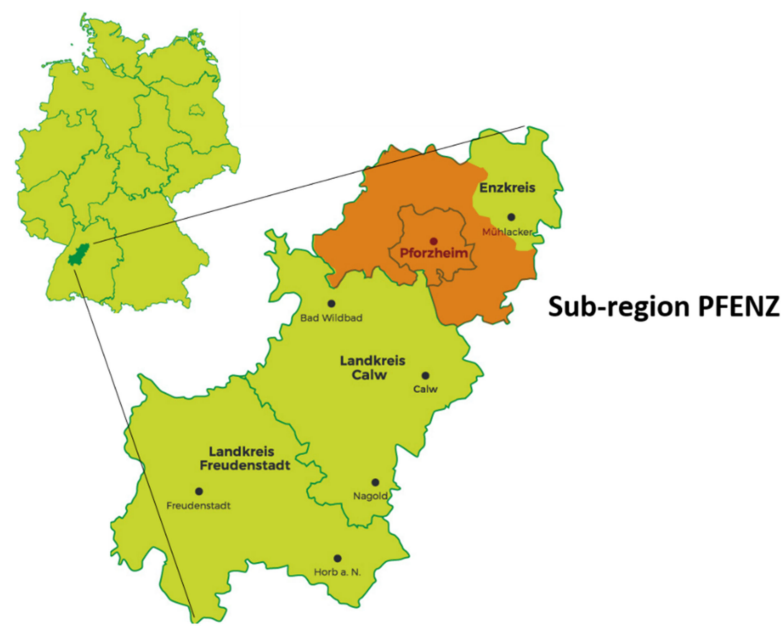
Using the case of the Northern Black Forest as a typical example, we brought together environmental, planning, and land use research and public policy analysis. We applied cross-impact balances (CIB) to build and analyze a participatory policy-interaction model. Together with a group of twelve experts from science and practice, we selected effective individual measures on the regional and municipal level to reach each of the three goals (in total, 27 measures) and analyzed their interplay (Section 2). With the help of CIB, we then assessed the current policy mix and designed alternative policy mixes without internal contradictions, as well as their synergy and goal attainment (Section 3). We discussed central contributions, limits, implications for the region, transferability, and avenues for further research (Section 4) and drafted a brief conclusion (Section 5).

This paper aims to address the goal conflicts of commercial land use management. We analyzed the contradictions of the current policy mix and identified effective policy combinations to simultaneously improve city-regional (urban-surrounding) cooperation, reduce commercial land take, and ensure the long-term economic development of a region. Our analysis reveals that the policy mix, which is currently in place on the regional and municipal levels in Germany, depicts internal contradictions and generates only little synergies. Many measures to foster city-regional cooperation and long-term economic development and reduce land take are hindered by the current practice of competing for municipal planning and marketing of commercial areas. Despite this, there are several alternative policy mixes that could achieve all three goals jointly, avoid contradiction, and generate significant synergy effects. Fundamental levers in these alternative mixes involve regional development strategy on commercial land, enforced municipal land policy to strengthen inward development, joint infrastructures in business parks, as well as joint regional commercial area management and marketing. Such policy mixes could overcome goal conflicts, improve city-regional cooperation, reduce land take, and simultaneously improve long-term economic performance.

## 2. Materials and Methods

### 2.1. A Case in the Northern Black Forest, Germany

As a case study, our analysis addressed the area of Pforzheim, a regional center of ca. 120,000 inhabitants in South-Western Germany, and its 22 surrounding communities belonging to a county named Enzkreis (with ca. 3000–12,000 inhabitants each). Together, administratively spoken, the center and surroundings form a sub-region (Mittelbereich Pforzheim) of 500 km<sup>2</sup>, abbreviated by PFENZ (see Figure 1). Along with two more rural counties (Landkreise), PFENZ is part of the Region's Northern Black Forest. PFENZ, as we argued in the following, is an exemplary case that is typical for several other cases and will prove to be more so in the future. First, the initial situation in PFENZ is challenging and, therefore, particularly instructive [54]. There is not only competition in commercial land planning between the city and surrounding municipalities but also, historically, a rather poor and conflict-laden relationship between the central city and the surrounding municipalities [55]. There is a severe lack of suitable areas for new commercial areas (greenfield development) due to topography and natural and regulatory constraints.



### Region Northern Black Forest

**Figure 1.** Location of PFENZ (figure adapted with permission from Wirtschaftsförderung Nord-schwarzwald GmbH).

In addition, there have been considerable wasteful practices of commercial land development in the past, e.g., by settling single-story logistics centers with large parking spaces on one of the last remaining large commercial areas. Finally, there is a rather difficult economic situation in the center and a heterogeneous economic situation in the surrounding municipalities. Thus, the center perceives a strong need to develop further land for commercial use to assure its economic development but has very few areas left in its own jurisdiction [26,56].

Second, PFENZ can be considered a typical case for many other densely populated and prospering sub-regions in Germany, and despite institutional and regulatory differences, to a certain degree also for city regions with medium-sized core cities in other European countries, such as France, Spain, or Poland. The current situation of policies and measures applied (i.e., the status quo policy-mix, see Section 3.1) is rather typical. The particular challenges regarding land scarcity in the case study area are to anticipate the issues most regions will be confronted with in the future when other land uses compete more intensely with commercial use. This future development is suggested by multiple land-use related political goals of the current Federal Government [57]: (1) reducing the net land take to zero by 2050 (in the Land of Baden-Württemberg, this goal is already to be met in 2035); (2) erecting wind turbines on 2% of the land; and (3) building 400,000 new housing units per year.

#### 2.2. Using Cross-Impact Balances (CIB) for Policy-Interaction Modeling and Policy Design with a Group of Experts

In order to design and assess policies that may lead to future-oriented commercial area management, we used CIB for policy interaction modeling (Section 2.2.1) within an inter- and transdisciplinary workshop series that brought together a group of experts from research and practice (Section 2.2.2).

##### 2.2.1. CIB for Policy Design—Assessing Consistency and Synergy of Policy Mixes

CIB is a qualitative yet semi-formalized form of systems analysis [52]. The principal goal of this method is to increase policy coherence. The method requires identifying system elements and exploring the interrelations found between them. A brief introduction



to CIB is given in Supplement S1. Initially, CIB was developed and used to construct future scenarios [58–63]. However, CIB also proved useful for qualitative forms of systems analysis [64,65], and recently, CIB has been transferred to the realm of policy design [52]. The main idea of this new application consists of considering goal conflicts on the level of policies to reach these goals and using the CIB balance algorithm to optimize all goals at the same time.

The approach comprises four steps [52]:

- Step 1: Identify and define central objectives as well as alternative policies to reach the goals;
- Step 2: Assess directed hindering and fostering impacts between policies (pairwise) through expert or stakeholder judgments;
- Step 3: Identify policy mixes with a high level of internal consistency;
- Step 4: Assess policy mixes, e.g., regarding their synergy, goal attainment, or other criteria.

*Internal consistency* of policies is measured by the CIB balance algorithm, which evaluates the direct and indirect influences of the policies on each other. With the help of the CIB algorithm, all thinkable policy combinations are analyzed, and the consistent mixes are identified. *Consistency of a policy mix* explains whether all sub-goals of a policy mix are present in an optimal state [52], i.e., whether, in a policy mix for each sub-goal, the optimal policy alternative (the one with the highest sum of impact arguments) is selected. Consistent policy mixes represent the Nash optima of the policy-impact network. They avoid major conflicting impacts, i.e., trade-offs, among all policies and maximize all related sub-goals, individually but at the same time. Consistency informs about the inner stability of a policy mix.

*Synergy* of a policy mix is measured by the sum of positive and negative impacts within each mix, i.e., the sum of interactions or total impact score (TIS) [52]. Synergy explains how well a policy mix combines fostering relations and avoids hindering relations between policies. It must be understood as a relative statement, i.e., policy mix X is more synergetic than policy mix Y. Maximizing synergies in policy mixes allows to benefit from supportive policy interactions and gives information on the overall effectiveness of a policy mix. The mix with the highest synergy (measured by TIS) can be considered the most (overall) effective one.

Regarding the relation between consistency and synergy, it is stated that “CIB solutions imply that each objective is ‘choosing’ its policy in an attempt to optimize its own synergy gains and the TIS represents the sum of all individual synergy gains” [52] (p. 43). Synergy helps policy makers to decide which mix would be the overall most effective combination (global information). Consistency describes the individual contradictions showed by a mix and helps in indicating the unequal distributions of gains and losses among the goals that also appear in synergetic mixes and can jeopardize the stability of the mix.

In the following, we specified how the four steps of CIB policy-interaction modeling and analysis were implemented.

### 2.2.2. Online Workshop Series with a Group of Experts from Research and Practice and Model Analysis

We invited a group of twelve experts from research (e.g., planning, political science, economic science) and practice (e.g., the regional planning authority, regional chamber of commerce and industry (CCI), regional economic development agency, Federal Environment Agency, State Ministry of Environment) to a series of online workshops (April to November 2021). We selected four experts with expertise for each of the three domains: inter-municipal cooperation, reduction in land take, and economic development. Four of the twelve experts had, in addition to their domain knowledge, particularly local knowledge about the region.

During the first step, a first online workshop took place during which the three goals, i.e., improving city-regional cooperation, reducing land take, and improving economic performance, were further specified into three sub-goals each (see Table 1). Moreover,

key policies were identified to achieve these sub-goals. To be most effective, each of these policies was combined with ancillary measures and preconditions. Finally, the policies currently implemented in PFENZ were identified (status quo) (see Table 1). The selected  $n = 27$  policies (status quo and alternatives) were further defined and detailed following the workshop and circulated among the expert group to assure a joint understanding of all measures (cf. Section 2.1 and Supplement S2).

**Table 1.** Overview of sub-goals and policies and their initial effectiveness (PFENZ). Status quo policies: target not (fully) achieved. Numerical value in brackets: effectiveness of individual policy with regard to the respective sub-goal. Based on a preliminary survey among the respective 4–5 topic experts, joint validation during workshop 2. Scale: (1) = not effective, (2) = less effective, (3) = rather effective, (4) = effective, (5) = very effective.

Goal	Sub-Goal	Status Quo	Option A	Option B
I Improve city-regional cooperation regarding commercial areas	1 Improve communication and trust	1S Irregular exchange between city and individual surrounding municipalities (3)	1A Informal expert group PFENZ (initiative of the regional planning authority) (4)	1B PFENZ mayors' group (initiative of the municipalities) (4)
	2 Joint development perspective for PFENZ	2S Priority areas for commerce and industry (regional plan) (4)	2A Joint statement of the municipalities in PFENZ on the regional plan (3)	2B Regional development concept commercial areas in PFENZ (4)
	3 Develop commercial areas in inter-municipal cooperation	3S Informal (and not very systematic or transparent) preliminary talks for inter-municipal commercial area development (3)	3A Cooperation agreement for the cooperation between the city and the surrounding municipalities in the development of commercial areas (4)	3B Special-purpose association for joint commercial area development between city and surrounding municipalities (5)
II Reduce land take for commercial purposes	4 Reduction and control of land use for commercial areas	4S Regional plan as a corridor for land use (3)	4A Regional plan (as 4S) + regional land monitoring incl. land development reports to review land policy objectives (4)	4B Regional plan + land-use monitoring (as 4A) PLUS regional quantity target with tradable quotas (5)
	5 Mobilize existing commercial land and buildings	5S Innovative purchase agreements (individual municipalities) (2)	5A Leasehold; interim acquisition (in case of insolvency of companies) (Basic approaches of municipal land policy (3,5))	5B Extended approaches to municipal land policy as interim acquisition, urban development contracts, and deconstruction obligations, etc. (4)
	6 Use of commercial areas in a land-saving and multifunctional way	6S Information on land-saving and multifunctional use (2)	6A Municipal incentives for multi-story and multifunctional construction (especially urban planning competitions, awarding of concepts) (4)	6B Lower land prices in return for multifunctional and public areas (3,5)

Table 1. Cont.

Goal	Sub-Goal	Status Quo	Option A	Option B
III Ensure long-term economic development	7 Future-oriented commercial area planning and implementation	7S Commercial areas planned from a municipal perspective (not strategic for PFENZ) (2)	7A Tools for cost-benefit analysis and monitoring of commercial area projects (4,5)	7B Shared infrastructures within commercial areas (4,5)
	8 Securing and creating (sustainable) jobs	8S Regional start-up consulting; cluster strategy of the city (3)	8A Promotion of research and development (R&D) in PFENZ (4)	8B Joint innovative settlement strategy and skilled labor strategy in PFENZ (5)
	9 Improve regional location quality	9S Individual municipal location marketing (heterogeneous, depending on the size and economic power of the municipalities) (2)	9A Gain and communicate a sustainability label for PFENZ (initiative of CCI and business development) (3)	9B Joint (collaborative) commercial area management and location marketing PFENZ (5)

During the second step, we split the expert group by domain of expertise into three groups of four experts. During small-group workshops, we first asked the experts to assess the effectiveness of each of the 27 individual measures to reach its (sub-) goal individually on a five-point scale (1 = ineffective, 5 = very effective). This assessment was discursively validated in the expert group. Second, we asked experts regarding interactions between measures (the status quo and the most effective alternatives). This means that we arranged the 27 measures as lines and rows of a CIB matrix and asked for every pair of measures, “Does measure “x” have an impact on the effectiveness of measure “y”? If yes, is it a fostering or a hindering impact? How strong is the impact?” We coded these impacts using a 7-point scale [53] (−3 = strongly hindering impact, 0 = no impact, +3 = strongly fostering impact). The full matrix can be found in Supplement S3. We also asked for verbal justifications and explanations for these impact assessments and noted and recorded the argumentation as well as the final group agreement for each assessment (see Supplement S4 for an example).

In phase three, we combined the results from all small-group workshops and constructed one joint CIB matrix containing all impact assessments as well as their verbal justifications. With the help of the CIB balance algorithm and the freely available CIB software *ScenarioWizard* we analyzed the matrix. The CIB software is available for free download at [www.cross-impact.de](http://www.cross-impact.de) (accessed on 1 March 2022). We assessed the consistency and synergy of the status quo (a mix combining only status quo policies) and searched for internally consistent policy mixes, i.e., mixes without contradictions. This means that we searched for combinations of measures that are stable in themselves, i.e., interfere or contradict each other as little as possible in their effectiveness. We sorted these solutions by cluster analysis [66] and diversity sampling [67,68] and selected the most diverse representatives for consistent, i.e., internally stable, and alternative policy mixes for commercial development in the future. An analysis of active and passive sums helped in further understanding our policy interaction model [69].

In phase four, we also analyzed the synergies resulting from the different consistent mixes. For this, we used the CIB total impact score (TIS), summing all positive and negative impacts of each mix. We then asked how well the different mixes reached the three different goals. Subsequently, we developed a new measurement to assess the quality of the different mixes to achieve the three overall goals. *Goal attainment* was calculated by summing the initial effectiveness of the policies with the total impact score TIS (interaction effect) per overall objective. We chose to give the initial effectiveness (rated on a 5-point scale) a double weight, with the argument that one strongly hindering impact from another policy (impact score = −3) should not annulate a policy individually considered rather effective (basic effectiveness score = 3), but the strongly hindering impacts by two other policies (impact sum = −6) might do so. In summary, to calculate goal attainment for each consistent mix,



we considered the initial effectiveness of the individual measures to reach each of these goals and summed it with the interaction effects by splitting the total impact score (TIS) by goal. We also calculated correlations between goal achievement. Finally, we presented our results in a third workshop to the expert group and discussed the plausibility of results, gaps, and limits of the analysis, as well as questions on how to implement alternative policy mixes in the region and assess the transferability of the approach and its results.

### 2.3. Sub-Goals and Individually Effective Measures

Table 1 summarizes the three sub-goals defined by the experts for each of the three overall goals, as well as their most relevant two alternative policies (options) as suggestions on how to reach each sub-goal better than with the current status quo policy (see Table 1). An example of the detailed definitions of sub-goals and policies, including auxiliary measures and conditions for each, is given in Supplement S2. Table 1 also indicates how the experts assessed the effectiveness of the *individual* policies (initial effectiveness). Policies vary in effectiveness when considered individually. Tendentially, status quo policies are considered less effective than alternative options. Initial effectiveness rating seems to be dependent on the clarity and concreteness of the definition of the measure. Examples of rather vague policies include 2A and 6B. Moreover, the critical feasibility—due to legal considerations—might have led to lower assessments of 6B. Experts unfamiliar with the situation in the region tended to rate the status quo policy more positively than the regional experts.

## 3. Results

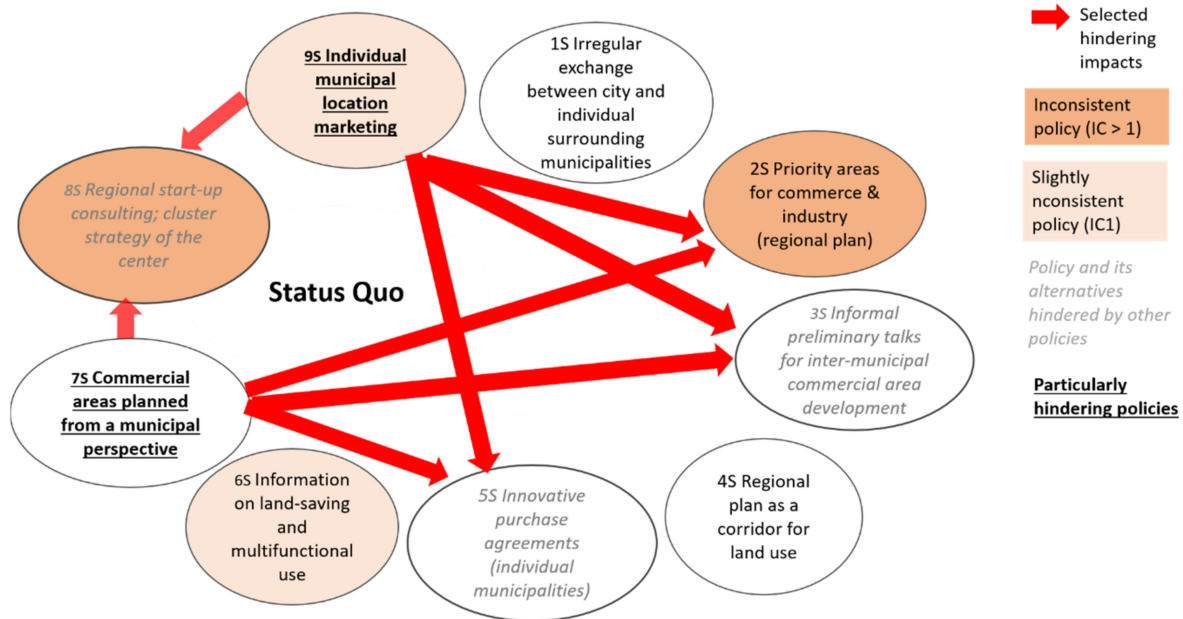
In this section, we described why the status quo mix is not an optimal solution (Section 3.1) and how alternative consistent and synergetic policy mixes for commercial area management may appear (Section 3.2). Subsequently, we discussed the policies not seen in any of the consistent mixes and the reason behind their absence (Section 3.3). Finally, we demonstrated how well the different mixes perform regarding the three different overall goals and how these overall goals correlate (Section 3.4).

### 3.1. The Status Quo Policy-Mix Is Inconsistent and Realizes Little Synergy

The policy-interaction model was first used to check whether individually composed policy mixes (combinations of one policy each per sub-goal) are internally consistent and how well they realize synergies or show conflicts between policies, as well as the reason behind. Analyzing the current status quo policy mix reveals that the nine individual policies have very low consistency values. This means that the respective impact balance of each status quo policy only slightly exceeds or lags behind the impact balance of the best alternative variant. Figure 2 shows that the mix contains several inconsistent policies (colored in orange), i.e., policies that are in contradiction with the other policies. This applies to four out of nine measures (2S, 6S, 8S, 9S).

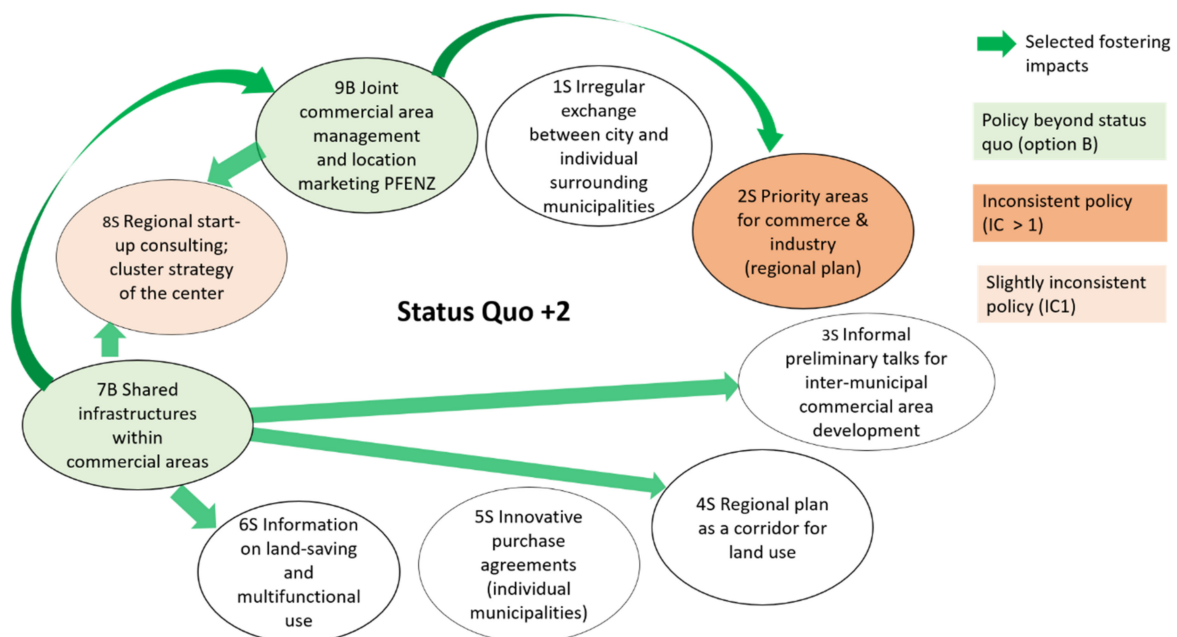
For three measures (S3, S8, and S5, in gray and italic print in Figure 1), the sum of the influences (impact sum) is negative for all variants (albeit to different degrees). Thus, in the status quo situation, these measures are inhibited in their effect, as their alternatives are. Finally, in the status quo policy mix, two policies, namely the municipal planning (7S) and municipal marketing (9S) of commercial areas, i.e., the municipal competition, strongly hinder the effectiveness of several other measures (red arrows in Figure 1). Most of these other measures are assessed as rather effective in reaching the three overall goals in PFENZ when considered individually: Priority areas for commerce and industry (2S, initial effectiveness value 4), innovative purchase agreements (individual municipalities) (5S, initial effectiveness value 2), informal preliminary talks for inter-municipal commercial area development (3S, initial effectiveness value 3), and the regional start-up consulting and cluster strategy of the city (8S, initial effectiveness value 3) are inhibited in their effectiveness by the *municipal* approaches to planning (7S) and location marketing (9S).

These more innovative status quo approaches are thus blocked from being effective by the traditional municipal competition regarding commercial areas in the status quo mix.



**Figure 2.** The status quo policy mix in PFENZ: inconsistent policies and hindering effects by municipal approaches to planning and marketing.

The policy-interaction model also helps in discovering the effects of changing individual policies in a mix. In this case, if one replaces the municipal planning (7S) with the planning of joint infrastructures (7B) and the municipal location marketing (9S) with joint area management and location marketing in PFENZ (9B), this leads to fostering relations within the mix (selected impacts represented by green arrows in Figure 3).



**Figure 3.** Changing individual policies leads to more mutually fostering relations, but the mix is still inconsistent and not very synergetic (selection of impacts, TIS = 48).

However, this mix is still not completely free of contradictions: The regional policy start-up consulting and cluster strategy of the center (8S) are still slightly inconsistent. The policy of priority areas (2S) remains highly inconsistent, as seven argument points more in favor of its alternative, the regional development concept “commercial areas in PFENZ” exist (2B). In short, it seems insufficient to alter a few status quo policies into more innovative policies, and it is difficult to find mixes “by hand” that are free of contradictions and make optimal use of synergies between policies. Using the CIB balance algorithm to systematically scan the policy-interaction network for overall consistent mixes provides the results presented in the following subsection.

### 3.2. Consistent Policy Mixes and Their Synergy

From the almost 20,000 theoretically conceivable combinations, 60 combinations, i.e., policy-mixes, are internally consistent. This means that they show no or almost no internal contradictions, implying no inconsistent policies. To account for evaluation uncertainty (e.g., in case an impact was evaluated +1 instead of +2), we also defined those policies as consistent, of which the impact sum is one point lower than the one of their alternatives (CIB inconsistency level 1 or IC1).

Diversity sampling, i.e., choosing mixes that are as diverse as possible and cover the space of possible mixes as broadly as possible, reveals six policy mixes. Cluster analysis [66–68] demonstrates that seven clusters can be identified, with each cluster sharing at least six out of nine policies (see Supplement S5). Behind each of the six diverse mixes, a cluster exists, i.e., a group of similar mixes (with variations), and thus, the diversity sample is a fair representation of the group of  $n = 60$  consistent or stable mixes. To represent the seventh cluster, we added one more mix to the selection, which we briefly present in the following. For an overview, see Table 2.

While the status quo itself is not consistent, interestingly, there is a consistent mix (“Status quo plus R&D”) close to the status quo, with eight out of nine status quo policies. In this mix, the regional start-up consulting and cluster strategy of the city (which has a municipal logic) are replaced by R&D funding in PFENZ, which has a regional logic. This new policy seems to stabilize the status quo by assuring the competitiveness of the regions’ innovation system by adding a regional perspective that does not contradict or hinder any of the municipal activities. This mix is consistent, meaning that it is internally stable but with very low consistency values per policy and very few synergies (see Table 2 and further interpretation below).

In the mix “First steps”, five status quo policies remain. Regarding cooperation (goal I), a regional development concept “commercial areas in PFENZ” (2B) introduces a strategic regional perspective on commercial areas. This policy is found in all internally consistent mixes (except for the mix “Status quo plus R&D”). In this mix, municipalities also increase their influence on commercial land through basic approaches of municipal land policy as leasehold and interim acquisition of commercial real estate (in case of insolvency of companies) (5A). This presents important changes regarding policies for the long-term economic development of the region (goal III) through common/shared infrastructures within commercial areas (7B) and joint commercial area management and location marketing (9B).

The mix “Planning competition” combines a regional development concept (2B) with more extended approaches of municipal land policy as interim acquisition (in the extreme case of expropriation), urban development contracts and deconstruction obligations, etc. (5B), and with municipal incentives for multi-story and multifunctional construction (especially urban planning competitions, awarding of concepts) (6A). This approach is further supported by strong policies to achieve goal III, namely, in addition to shared infrastructures within commercial areas (7B) by a joint innovative settlement strategy and skilled labor strategy in PFENZ (8B) and a sustainability label for PFENZ on the initiative of the chamber of industry and commerce and of the business development agency (9A).

**Table 2. Selection of consistent mixes, to be read in columns, status quo white, option A blue, option B green; unique selling points of each mix within this selection (measures unique to this mix) in bold print.**

Main Topic	Status Quo Plus R&D	First Steps	Planning Competitions	Negotiating	Enforced Planning	Narrow Inter-Municipal and Strategic Cooperation	
Diversity	x	x	x	x		x	x
From Cluster	1	4	3	7	6	5	2
Variants						Cooperation agreement	Special purpose association
Consistency	IC1	IC1	IC1	IC1	IC1	IC0	IC1
Synergy (TIS)	15	68	68	98	92	(a) 84; (b) 97	102
Goal	<b>Sub-goal</b>			<b>Policies</b>			
I Improve city-regional cooperation on commercial areas	1 Improve communication and trust	1S Irregular exchange between city and individual surrounding municipalities		<b>1B PFENZ mayors' group (initiative of the municipalities)</b>	1A Informal expert group PFENZ (initiative of the regional planning authority)	(a) 1S Irregular exchange between city and individual surrounding municipalities (b) 1A Informal expert group PFENZ (initiative of the regional planning authority)	1A Informal expert group PFENZ (initiative of the regional planning authority)
	2 Joint development perspective for PFENZ	<b>2S Priority areas for commerce and industry (regional plan)</b>			2B Regional development concept "commercial areas in PFENZ"		
	3 Develop commercial areas in inter-municipal cooperation	3S Informal (and not very systematic or transparent) preliminary talks for inter-municipal commercial area development				<b>3A Cooperation agreement for the cooperation between the city and the surrounding municipalities in the development of commercial areas</b>	<b>3B Special-purpose association for joint commercial area development between city and surrounding municipalities</b>

Table 2. Cont.

	Main Topic	Status Quo Plus R&D	First Steps	Planning Competitions	Negotiating	Enforced Planning	Narrow Inter-Municipal and Strategic Cooperation
II Reduce land take for commercial purposes in PFENZ	4 Reduction and control of land use for commercial areas	4S Regional plan as a corridor for land use			4B Regional plan (as 4S) plus land use monitoring (as 4A) PLUS regional quantity target with tradable quotas	4A Regional plan (as 4S) plus regional land monitoring incl. land development reports to review land policy objectives	4A Regional plan (as 4S) plus regional land monitoring incl. land development reports to review land policy objectives
	5 Mobilize existing building land and buildings	5S Innovative purchase agreements (individual municipalities)	5A Leasehold; interim acquisition (in case of insolvency of companies) (Basic approaches of municipal land policy)	5B Extended approaches to municipal land policy (as interim acquisition, urban development contracts and deconstruction obligations)		5S Innovative purchase agreements (individual municipalities)	5B Extended approaches to municipal land policy (as interim acquisition, urban development contracts and deconstruction obligations)
	6 Use of commercial areas in a land-saving and multifunctional way	6S Information on land-saving and multifunctional use		6A Municipal incentives for multi-story and multifunctional construction (especially urban planning competitions, awarding of concepts)	6S Information on land-saving and multifunctional use		
III Ensure economic development PFENZ	7 Future-oriented commercial area planning and implementation	7S Commercial areas planned from a municipal perspective (not strategic for PFENZ)		7B Shared infrastructures within commercial areas			
	8 Securing and creating (sustainable) jobs	8A Promotion of research and development (R&D) in PFENZ	8S Regional start-up consulting; cluster strategy of the city	8B Joint innovative settlement strategy and skilled labor strategy in PFENZ			
	9 Improve regional location quality	9S Individual municipal location marketing (heterogeneous, depending on the size and economic power of the municipalities)	9B Joint business park management and location marketing PFENZ	9A Gain and communicate a sustainability label for PFENZ (initiative of CCI and business development)	9B Joint business park management and location marketing PFENZ		9A Gain and communicate a sustainability label for PFENZ (initiative of CCI and business development)



The mix “Negotiating” combines strong economic policies with different forms of cooperation, namely a mayors’ group on the initiative of the municipalities (1B), which supports and is supported by an extension of the regional planning instruments beyond the regional plan in the form of land use monitoring and a regional quantity target with tradable quotas (4B). This planning instrument is consistent only in mixes that also provide an arena for that trade, as reciprocated by the mayors’ group.

The Mix “Enforced planning” combines the strong economic policies with an informal expert group PFENZ on the initiative of the regional planning authority (1A) as well as with regional planning instruments beyond the regional plan in the form of land monitoring, including land development reports to review land policy objectives (4B); however, it does not foresee a regional quantity target nor tradeable quota.

Next, we see mixes that can be labeled “Narrow strategic and inter-municipal cooperation”. One variant is marked by a “Cooperation agreement for the cooperation between the city and the surrounding municipalities in the development of commercial areas” (3A). This variant is fully consistent (IC0) with both; an irregular exchange between the city and individual surrounding municipalities (1S) or an informal expert group PFENZ (an initiative of the regional planning authority (1A)). The other variant is a mix with a “special-purpose association for joint commercial area development between city and surrounding municipalities” (3B). This mix belongs to a cluster of mixes with a special-purpose association as their “unique selling point”.

All 60 consistent mixes (except for the Status Quo plus R&D mix) share the regional development strategy regarding commercial land use (2B) and sharing joint infrastructures in commercial sites (7B). The innovative joint settlement and skilled labor strategy in PFENZ (8B) is almost as dominant as 2B and 7B. This measure for achieving sub-goal 8 secure and create (sustainable) jobs is found in 56 of the 60 mixes, which are further always found to be in combination with 2B and 7B. Another dominant measure is information on land-saving and multifunctional use (6S). It is included in  $n = 51$  of the 60 mixes. Although its initial effectiveness is rather low (2), this informational policy is highly compatible with all other policies and (almost) not hindered by any other policy. These three dominant policies can be considered (quasi) unavoidable for any consistent policy mix going considerably beyond the status quo. However, as our results showed, several different policy mixes are equally consistent.

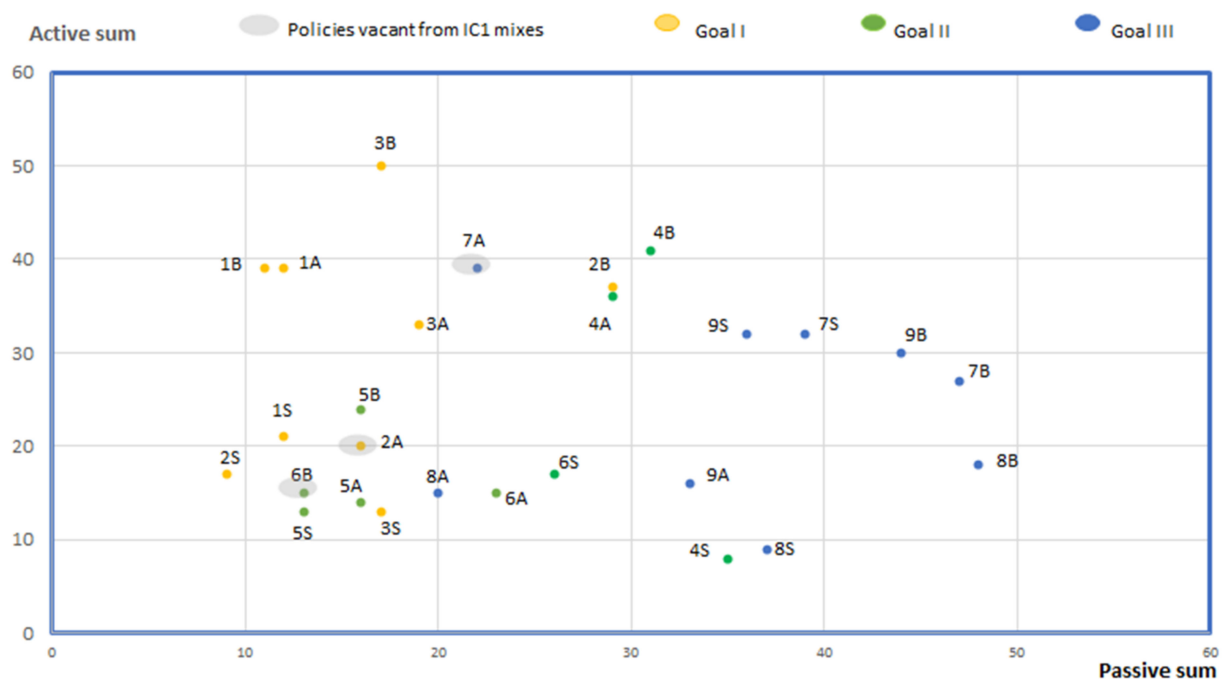
The consistent mixes diverge regarding their degree of *synergy*, expressed by the Total Impact Scores (TIS), with a range from 15 to 111 points (see Supplement S6). The two mixes close to the status quo clearly illustrate the lowest synergy scores. There are several thousands of inconsistent mixes, which show higher overall synergy values. The two consistent mixes close to the status quo lie at about 3% of the TIS percentile. This phenomenon of low synergy but consistency can be interpreted as a “lock-in effect”. The literature states that “consistent mixes can lead to suboptimal global synergy gains, when no objective (or the actors behind it) can pave the way to a globally better solution by its own one-sided policy portfolio” [49] (p. 43). Synergy, i.e., overall effectiveness, of the other mixes is much higher, starting from the 70% TIS percentile. However, higher synergies also vary considerably, with the mixes “Planning competition and “First steps” showing the lowest and mixes from the “Special purpose association” cluster showing the highest synergy values.

### 3.3. Policies Absent from Any Consistent Mix

Three policies from the initially selected list of  $n = 27$  are not consistent with any of the  $n = 60$  mixes and thus, do not appear in any of them. These are the joint statement of the municipalities in PFENZ on the regional plan (2A), lower land prices in return for multifunctional and public land (6B), and finally, tools for cost–benefit consideration and monitoring of commercial land projects (7A). By comparing the column sums (impact sums) of these policies and their alternatives in the matrix (Supplement S3), it can be seen that there are considerably fewer supporting arguments coded for all three vacant policies

than for their respective alternatives. This means that these policies have a difficult time from the outset asserting themselves against their alternatives. Albeit they are not seen as being hindered by other policies, experts consider that the other policies do not support them. This results in large differences regarding column sums of alternatives. One part of the explanation for these low impact sums might also be that during impact assessment, experts presented doubts regarding the local feasibility (in the case of 2A) and the legal feasibility (in the case of 6B).

However, for 7A, the initial expert assessment suggested that, when considered individually, tools for cost–benefit analysis and monitoring of commercial area projects would be an active, impactful measure (see Section 2.1). As the policy 7A was assessed as interesting and individually very effective by the experts, as it is not being hindered by other policies, but its alternatives are more strongly promoted, we propose to have a closer look at this policy. In addition, comparing active (line) and passive (row) sums of individual policies (Figure 4) demonstrates that 7A would be an active, impactful measure if only it is promoted and supported by other measures.



**Figure 4.** Active and passive sum of all individual policies.

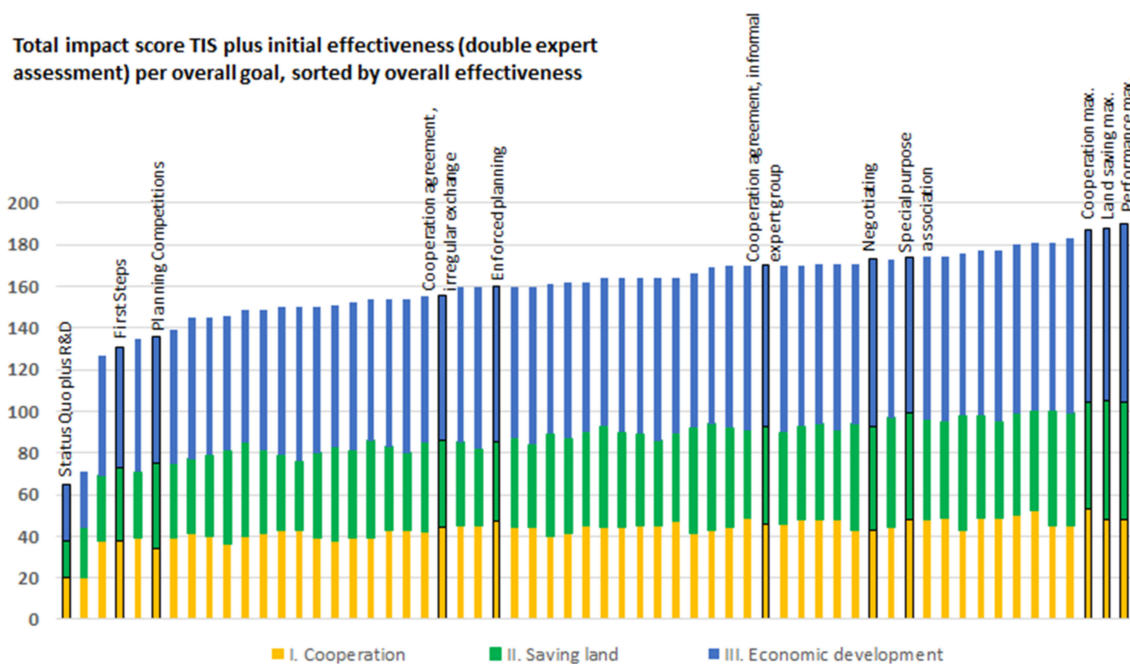
### 3.4. Goal Attainment by the Consistent Mixes and Correlation between Goals

Therefore, we assume, in the form of a thought experiment, 7A to be set in PFENZ due to further policies outside those considered in our model as legal requirements (federal law) or joint decisions (regional agreement). If we “enforce” 7A within the matrix, additional consistent mixes appear. We found  $n = 5$  solutions that are fully (IC0) and  $n = 56$  further solutions that are almost fully (IC1) consistent. Scanning these solutions for similarity with the mixes identified before and sampling them by diversity shows that tools for cost–benefit analysis and monitoring of commercial area projects (7A) could be included in several types of mixes, such as those of “Narrow strategic and inter-municipal cooperation” as well as “Planning competitions”. Jointly, with a regional development concept “commercial areas” in PFENZ (2B), regional land monitoring incl. land development reports to review land policy objectives (4A) and a joint commercial area management and location marketing PFENZ (9B), it could also form another “Enforced planning” mix with five remaining status quo mixes. Nonetheless, these considerations only hold if forces external to our model are strong enough for the tools for cost–benefit analysis and monitoring of commercial

area projects (7A) to become an incontrovertible and unavoidable policy for all players in the region.

### 3.4.1. How Well Do the Different Mixes Achieve the Three Goals?

Figure 5 illustrates how well the different  $n = 60$  mixes achieve the three overall objectives (for the calculation of the goal achievement from initial effectiveness and interaction effects, see Section 2.2.2).



**Figure 5.** Goal attainment of consistent mixes: How well do the different mixes achieve the three overall goals?

By examining these results, it can be seen that the goal achievement values of the individual mixes for the overall objective of economic development (goal III) demonstrate a significantly higher value than for the other two objectives. There are two reasons for this. First, the nine measures in the matrix to achieve goal III are almost all passive or highly interlinked measures that receive many effects from the other measures. Second, all alternative measures (all “a” and “b” measures) have high initial effectiveness for achieving the sub-goals of goal III. For the interpretation of the results, it should be noted that the measures for goal I, “Improve city-regional cooperation”, represent active measures that significantly contribute to the achievement of the other goals. Conversely, however, the measures for achieving the sub-goals of overall goal I benefit less from interaction effects through measures for overall goal II, “primarily buffering or networked measures”, and overall goal III, “passive or networked measures”. Therefore, to achieve better results, goal I, as well as goal II to a lower degree, would need to be supported by additional framework conditions outside of our analysis, as goal I benefits from fewer “positive side effects” from measures targeting goals II and III.

How well are the various overall goals being achieved by different policy mixes? Overall, the mixes close to the status quo are relatively weak, while the mixes beyond the status quo are much stronger in achieving all three goals; this difference is particularly significant regarding goal I and goal III. The “First steps” mix has nearly twice as high a score on all three goals as the worst-performing “Status quo plus R&D” mix. The mix “Planning competitions” performs better to some degree, especially regarding land saving and economy. However, the other mixes in our selection are significantly stronger in terms of goal achievement. The mix “Enforced planning” has an overall effectiveness of 160 value

points, with rather high values for cooperation and economic development but poor results regarding saving land. The mix “Cooperation agreement” in its variant b), the informal expert group on the initiative of the regional planning authority, performs better on all three objectives than its variant a), with an irregular exchange between the city and the surrounding area (+4 index points on objectives I and II; +7 points on objective III). The “Negotiating” mix performs +5 index points better than the “Special purpose association” mix for the economic development objective III, but 5 index points worse for cooperation (goal I).

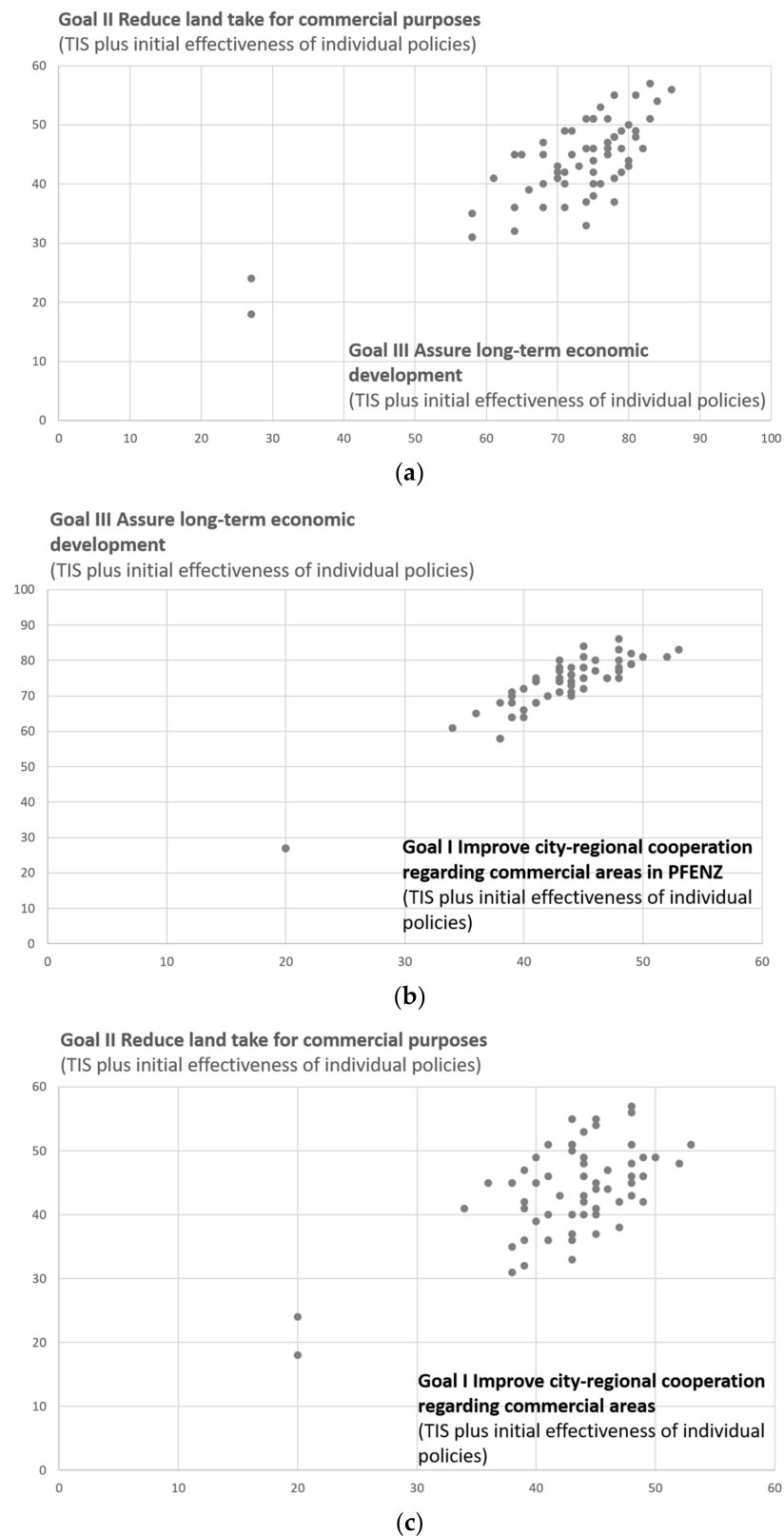
The mixes that best achieve the overall objectives belong to the “Special purpose association” cluster (see Supplement S5). The mix consisting of “b” measures only and of 6S (on the far right in Figure 4) possesses the best overall goal achievement (“Performance max”) and performs best regarding goal III, economic development. A variant of this mix, which includes a sustainability label (9A) instead of joint area management (9B), shows satisfactory performance, especially with respect to objective III (−8 points) and with respect to objective I (−5 points). The mix with the maximum goal attainment regarding cooperation (goal I) (“Cooperation max”) is a special-purpose association variant with leasehold (5A) and with area monitoring, including area development reports (4A), but without any regional quantity target and tradable quotas. The mix with the maximum performance in land saving (“Land saving max”) corresponds to the mix known as “Performance max” but replaces the mayor’s round by the informal expert group of the regional planning authority. In this mix, the assumption appears that experts under the aegis of the regional planning authority possibly place the goal of land saving higher than this is the case in the political considerations of a mayor’s round.

#### 3.4.2. How Well Are the Three Overall Goals Achieved Simultaneously in the Consistent Mixes?

Figure 6 shows that the overall objectives in the consistent mixes seem to present a linear relation and positive correlation with each other. In order to support our interpretation of the direction of these correlations, we also considered the active and passive sums of all policies, which inform about their role in the impact network (Figure 4).

First, there is a surprisingly strong positive relationship ( $r^2 = 0.59$ ) between goal III (ensure a long-term economic development in PFENZ) and goal II (consume less land for commerce in PFENZ) (Figure 6a). This positive correlation seems counter-intuitive at first, as it does not follow the literature’s assumption of the classic economy vs. environment conflict. However, the measures formulated for goal III in our policy-interaction model contain a notion of long-term, sustainable economic development that does not exclude land saving. If the (low) values of the two status quo mixes are excluded from the analysis, the correlation between the achievement of both goals in the  $n = 58$  mixes beyond the status quo is still considerable ( $r^2 = 0.41$ ).

Regarding possible effects of urban-rural cooperation (goal I) on the economy (goal III) and the ecology, namely land use by commerce (goal II), we achieve the following results: The strongest positive correlation (Figure 6b) shows between improving city-regional cooperation in the commercial sector (goal I) and increasing economic performance in PFENZ (goal III) ( $r^2 = 0.925$ ). Presumably, this is because both goals are strongly linked via regional approaches to commercial land strategy, management, and utilization, as well as synergies between these approaches. Considering that cooperation (goal I) policies in our model are rather active and economic policies are rather passive (Figure 3), improving the city-regional cooperation in the commercial sector (goal I) can be considered to promote long-term economic development (goal III) of a region.



**Figure 6.** Relation of the overall objectives to each other in the  $n = 60$  consistent policy mixes (goal attainment calculated by (double) initial effectiveness of the individual measures plus Total Impact Score TIS): (a) goal II and goal III; (b) goal III and goal I; (c) goal II and goal I.

Finally, the correlation between goal I, to improve city-regional cooperation in PFENZ in the commercial sector, and goal II, and take up less land for commercial activities in



PFENZ, is clearly weaker ( $r^2 = 0.42$ ) (Figure 6c). Presumably, the relationship between these two goals is not as immediate and unidirectional as the literature on inter-municipal cooperation and land use saving postulates. Instead, effective land-saving approaches are often largely decided and implemented at the *municipal* level (sub-goal 5 and 6). These policies of (re)densification seem not to contradict the measures to improve inter-municipal or regional cooperation.

#### 4. Discussion

We discussed the central contributions and limits of our study as well as future research avenues regarding policy coherence for a sustainable transformation of commercial land use (Section 4.1) and regarding the use of the method CIB for policy-mix evaluation and design (Section 4.2).

##### 4.1. Towards Policy Coherence for a Sustainable Transformation of Commercial Land Use

Our analysis of the Northern Black Forest region shows that, in order to remain viable in the future, commercial land use management cannot focus unilaterally on short-term economic goals but must, over the long term, realize several goals simultaneously. Today's instruments and measures for regional cooperation, land conservation, and commercial land management depict clear internal contradictions and generate only very few synergies. This is a surprising insight as the German system of regional planning is considered to be comprehensive-integrative and mature in international comparisons [70]. In particular, the current practice of competing for *municipal* planning and marketing of commercial sites has an inhibiting effect on all three goals.

The analysis also presents how effective policy combinations could be designed to improve city-regional cooperation, reduce land take, and simultaneously ensure the long-term economic success of a region. First, introducing single new measures into the existing policy mix will not be sufficient to significantly increase goal attainment. Following or pushing one preferred policy (e.g., leasehold (5A), which is currently prominently discussed in the PFENZ region) is likely to not change the overall governance of commercial land use. Instead, the measures' effect (even with high basic effectiveness given) will become lost in trade-offs through hindering effects by the mutual interrelations of the status quo policies. Instead, new measures must be considered in consistent bundles, which mutually enforce each other. Examples that we found for levers to be set in motion are a regional development strategy regarding commercial land use (2B) and sharing joint infrastructures in commercial areas (7B).

According to our policy-interaction model, changes appear inevitable in all mixes going beyond the status quo; these *basic or inevitable policy changes* are the aforementioned regional development strategy regarding commercial land use (2B) and sharing joint infrastructures in commercial areas (7B) while also implementing a joint, i.e., collaborative, commercial area management (9B), as well as measures to reduce land consumption and strengthen re-densification (see policies to achieve sub-goals 4–6). Including these inevitable changes, *alternative policy mixes*, followed by adding further measures, also achieve the three goals together, avoid contradictions between measures and prove to be more synergetic. The analysis also shows the policies that were assessed to be quite effective individually but do not prevail in any consistent mix. In particular, this is the case regarding “tools for cost-benefit analysis and monitoring of commercial area projects” (7A). This policy, to be part of a consistent policy mix, would require support from further strategies or policies, potentially in the form of mutual agreements. These different mixes—as well as the information on policies that do not find their way in any consistent mix—can be considered valuable information for policy makers on municipal, regional but also superordinate levels. The results, in the form of options, could inform their policy-making processes and are a valuable addition to policy documents considering policies individually [10,17]. With respect to transferability, the diagnosis regarding the (deficient) status quo policy mix seems highly transferable to many other city regions, in which

municipal competition and parochial thinking are dominant and suitable commercial land becomes scarcer. Furthermore, the alternative policy mixes identified in this study might be transferable to other densely populated and prosperous regions.

Our results also add to the literature's assumptions that (a) there is a conflict of goals between economic development and land saving, and (b) inter-municipal cooperation can help to achieve these two goals. In our model, mixes with high performance regarding future-oriented economic development (goal III) are simultaneously strong in reducing land take (goal II). This result seems to be highly influenced by the integrated and broad understanding of economic development in this study, which, at least implicitly, integrated social and ecological dimensions in the definition of goal III as well as its sub-goals and the selected measures. Thus, if *sustainable* economic development is the goal, our correlation analysis shows it is not conflicting with the land-saving goal but rather shows synergies. However, such a broad understanding of the practice of local politics requires the inclusion of different administrative and disciplinary perspectives, which is usually not the case [31,71]. However, this is a promising result indicating ways to exit the apparently fundamental conflict of commercial land use between economic and environmental goals and towards one of the rare, win-win solutions in land use planning and management [72].

Our analyses also demonstrated that mixes that performed well in achieving goal I also performed well in achieving goals II and III. Inter-municipal cooperation regarding commercial areas seems to help both to reduce land take [11–13] and to contribute to long-term economic development [24,25]. However, the positive side-effects of policies aiming at cooperation (goal I) and those aiming at the long-term economic development of a region (goal III) seem more direct and clearer than mutually supportive effects between cooperation and saving the use of commercial land (goal II). The positive relation between inter-municipal cooperation (goal I) and reducing land take (goal II) seems far from automatic and might be hampered by a mismatch of scales. Land saving strategies and instruments on the inter-municipal, sub-regional, or even regional level would avoid such a mismatch of scale; however, it would challenge municipal autonomy. The problem of the lack of integration of different administrative and disciplinary perspectives becomes virulent: regional economic development agencies or planning associations often know about the advantages of regional cooperation [71,73]. However, decisions for or against inter-municipal cooperation are made in the municipal councils. On the municipal level, the issue of economic development is still closely tied to commercial tax revenues and considered dominantly from a municipal perspective [29]. The relationship between city-regional cooperation (goal I) and reducing commercial land consumption (goal II) needs further empirical investigation. Finally, our analysis attributes high importance to cooperation policies. However, in order to achieve higher levels of goal attainment, measures to reach goal I would require further support by overarching strategies, potentially on the land or federal level, as subsidies for inter-municipal or regional cooperation that compensate for potential losses of municipal autonomy [74].

A caveat to these results, however, is that they are not based on an empirical analysis of factual land-use decisions. Instead, our model is based on expert judgments, which in turn reflect the assumptions of the literature as well as the knowledge and beliefs of the expert sample. In addition, for reasons of feasibility, we limited our study to the selection of three overarching goals with three sub-goals and considered 27 policies only (the status quo plus two alternative policies per sub goal). This selection clearly is a simplification of the situation, especially regarding the perspective of sustainable development of commercial areas. Sustainable development comprises a multitude of dimensions (see the 17 Sustainable Development Goals SDG [75]). Sustainable commercial land use does not only need to reduce land take, but also reduce the use of other resources (during construction, operation, and reuse of commercial areas). It further comprises social, cultural, ecological, climate-related, and political dimensions that are not considered in our analysis. Future research could perform comprehensive sustainability assessments of the different policy mixes found by our analysis. Possible methodological approaches

to comprehensive sustainability assessments within CIB models are pointed out by the literature (e.g., [52,76]).

Our results seem valid for city regions with a comparable policy mix and where comparable (political) main goals apply. For other (sub-)regions (and in different country contexts), which prioritize different goals and have other potential strategies, one could apply the methodology of this study but would need to set up an adapted policy-interaction model. Further research should also differentiate more strongly between the planning, development, and use of small vs. large commercial sites.

Finally, the policy-interaction modeling approach and the results provide new information on policy interactions. This information could be useful in municipal and regional decision-making processes toward more coherent governance of commercial land use. The implementation of more consistent and synergetic policy mixes then remains a political task.

#### 4.2. CIB for Policy Mix Evaluation and Design

With this study, the policy-interaction modeling approach was shown to be transferable to other issues and regions [52]. CIB for policy mix evaluation and design can be used for policy design regarding sustainable land use and regional development. The approach could be especially interesting to analyze increasing land-use conflicts [2], e.g., reducing land take vs. increasing land use for housing, renewable energies, and potentially also for agricultural production.

Regarding more specific methodological issues, our study makes the following contributions. First, our analysis adds to the understanding of the relation between consistency and synergy of policy mixes. Foregoing studies [52] (p. 43) found that “[. . .] in our case [. . .] striving for individual optimization (consistency) can be expected to find reasonable global solutions (synergy)”. This case adds to these findings: Some mixes, albeit being consistent (namely the mix combining status quo measures with R&D funding in PFENZ), show very low synergy rates that we interpreted as lock-in effects of the Nash-equilibria (see Section 3.2). The other consistent mixes in our case lay at least in the 70% TIS percentile of the TIS distribution. The best consistent mix with TIS = 111 marks the absolute TIS maximum. Optimizing individual goals thus manages in the best case to reach the cooperative optimum in a self-organized way. However, the individual optimization can exceptionally result in a dead end. While synergy informs us about the policy mix that would be most effective (globally), consistency tells us the policies (even in synergetic mixes) that contradict each other. Thus, resonating with the argument to consider not only synergies but also trade-offs [39], CIB allows us to consider both consistency and synergy and interpret them together. First, this allows for avoiding instabilities, which are indicated by internal inconsistencies within presumably overall *synergetic* mixes. Inconsistencies indicate where individual policies are more strongly hindered than supported in their effectiveness in the interplay with other policies. Second, this allows for avoiding lock-ins that might block internally consistent policy mixes from being synergetic and finally effective. Our conclusion would be that it can be necessary to separate locked-in solutions in fruitful destruction to destroy stability if one can assume justifiably that a better state, in terms of synergy, is achievable.

Second, the validity of expert judgments (impact assessments) required by CIB studies is threatened by subjectivity and bias by nature [60,77,78]. However, we can be confident that the impact assessments in this policy-interaction model go well beyond individual experts’ gut feelings, as our study design, confronting the views of local experts with those of external issue experts in small groups during online workshops, fostered the discursive validation of every impact assessment [79,80]. Therefore, it combined the advantage of expert interviews with the advantages of group discussions and supported inter- and transdisciplinary knowledge integration of local expertise and general issue expertise [81].

Third, our study has introduced a new measure into CIB for policy-mix evaluation and policy design, namely the measure of goal attainment (beyond overall effectiveness). Our analysis demonstrated that the initial effectiveness alone is not sufficient to determine

the contribution of a policy to goal achievement in the combination of measures, as this effect is moderated by policies' interactions. Therefore, we summed the initial effectiveness with the effects of interrelations between measures into a new measure for goal attainment that is overall differentiated by the goal. We observed that the more abstract or context-dependent the policies, the more difficult to assess their initial effectiveness. Future research could further inquire about the relation between the initial effectiveness of policies and the effects of interrelations on final goal attainment and might propose further approaches. For instance, it would also be possible to consider the initial effectiveness of every policy as a moderating factor within the matrix (see Supplement S8) or to systematically analyze the role of the assumed initial effect on the experts' assessments of policy interrelations.

## 5. Conclusions

The governance of commercial land use must address multiple goals and design and implement effective policy combinations that improve city-regional cooperation between municipalities, reduce land take, and assure the long-term economic development of a region simultaneously. By using the Northern Black Forest as a case study, we brought together environmental, planning, and land use research as well as public policy analysis. We applied cross-impact balances (CIB) to build and analyze a participatory policy-interaction model, selected effective individual measures to reach each of the three goals, and analyzed their interactions. With the help of CIB, we then assessed the current policy mix and designed alternatives.

Our analysis revealed that current approaches to regional cooperation, reducing land consumption, and commercial land management depict clear internal contradictions and generate very few synergies. In particular, the current practice of competing for municipal planning and marketing of commercial sites has inhibiting effects. Implementing innovative measures on a stand-alone basis runs the risk of not being sufficiently effective. Therefore, to become more effective in reaching fundamental planning objectives, several mutually supportive levers must be moved simultaneously. We identified alternative policy mixes that achieve all three goals, avoid trade-offs, and generate significant synergy effects. Fundamental levers in these alternative mixes are a regional development strategy on commercial land, joint infrastructures in business parks, collaborative regional management, and marketing of commercial areas, and finally, strengthening inward development through enforced municipal land policy. Such policy mixes could overcome goal conflicts and improve city-regional cooperation, reduce land take, and sustain the economic performance of a region at the same time. In summary, the study introduces CIB to analyze goal conflicts, perform policy mix evaluation, and design into land use and planning research. This approach allows for the assessment of consistency, synergy, and goal attainment of different policy mixes, and thus, it is a useful tool for a more coherent and sustainable inter-municipal or even regional (commercial) land-use governance.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/land11060795/s1>, Supplement S1 [82]: CIB in a nutshell; Supplement S2: Example for a detailed definition of a sub-goal and its alternative policies; Supplement S3: CIB Matrix; Supplement S4: Example for impact logics and their verbal justifications; Supplement S5: Cluster analysis; Supplement S6: Total impact score of consistent and inconsistent mixes; Supplement S7: Sampling of mixes by best goal attainment; Supplement S8: Initial effectiveness as a moderating factor within the matrix.

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