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Oil and Gas Development in a Coastal Landscape: Visual Preferences and Management Implications

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Abstract This study examines the relationships of four general landscape characteristics to viewer preference for a coastal landscape including oil and gas development. Landscape management possibilities that address these characteristics are apparent naturalness, compatibility of development with its setting, and ephemeral characteristics, including tidiness.

Forty residents of and visitors to a Louisiana Gulf Coast island were interviewed. They were asked to describe and rate the attractiveness of local views. Three hundred and ninety-three views containing a total of 99 features were described. A content analysis determined which of the 99 features were present in each view. Then factor analysis was performed on the feature presence classifications to suggest viewtypes. The 26 factors, or

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viewtypes, resulting were related to view ratings in a regression analysis. Results suggest that, while natural-appearing coastal landscapes are attractive, some developed landscapes may also be attractive. Compatibility, nighttime viewing, and tidiness enhance the attractiveness of developed landscapes. Where these characteristics become part of the design and maintenance program for oil and gas facilities, viewer preference may increase.

Introduction

Historically, coastal oil and gas drilling in the United States is in its early stages. Only a small proportion of the oil and gas estimated to exist beneath the continental shelf has been recovered. In light of the federal government's current leasing schedule, we are likely to soon see more oil and gas exploration and drilling off our coasts.

One of the important impacts of this activity will be changes in the appearance of coastal areas. While this impact must be considered under numerous federal and state laws and regulations (Smardon and Felleman, 1982), no widely-accepted visual assessment procedure exists. Before such a procedure can be validly developed, more information about viewers' perceptions of coastal landscapes is needed.

Objectives

The study reported here describes viewer preferences for a Louisiana Gulf Coast landscape where oil and gas drilling has existed for more than thirty years. It examines four general landscape characteristics as they relate to viewer preference: apparent naturalness of the landscape, compatibility of development with its setting, ephemeral landscape characteristics, and tidiness.

Potentially this research may inform the development of a coastal visual management procedure. Procedures that have been developed to manage inland landscapes (e.g., U.S. Bureau of Land Management, 1980; U.S. Forest Service, 1974) may not be adequate for the visual management of coastal areas, which have some
unique inherent landscape characteristics. Both the presence of water in landscape views and the panoramic scope of views from the coast create intrinsic visual appeal (e.g., Dearinger, 1979; Palmer, 1978). Beyond these, the characteristics which were the focus of this study further influence preference.

**Apparent Naturalness**

That apparent naturalness is positively related to preference has been shown in numerous studies (e.g., Nassauer, 1979; Kaplan et al., 1972). The question of what looks natural creates difficulties in assigning this variable to development in coastal landscapes. Coastal landscapes are often seen by travelers who do not know the landscape, and some development in coastal areas is far from the viewer.

In at least one coastal landscape where oil and gas development exists, what you see may not be what you get. In their study of the Los Angeles County coast, Banerjee and Gollub (1976) found that viewers who knew the real identity of offshore platforms camouflaged with sculptural elements and trees, rated views to these platforms lower than did naive viewers. Though this example may be nearly unique, casual visitors may also mistake undisguised platforms distant from shore for other objects. Distant platforms might even be invisible to travelers seeing a drilling area on an overcast day. In either case, viewers familiar with the coastal area might interpret naturalness of a view differently than naive visitors.

**Compatibility of Development with Its Setting**

Many professional assessments of coastal landscapes have included compatibility as an important predictor of visual quality. Baird et al. (1979) used compatibility with surrounding viewshed in assessing the visual impact of liquefied natural gas terminals proposed for the California coast. Blair et al. (1982) report that compatibility with adjacent urban neighborhoods was the overall criterion for evaluating proposals for the redevelopment of piers 90 and 91 in Seattle.
A number of measures indicative of compatibility have been found to be related to scenic beauty evaluations. In their studies of viewer evaluations of inland landscapes, Feimer et al. (1981) found that compatibility, congruity, intactness, and form change scores correlated significantly with scenic beauty change scores. Building color and size in relation to setting also affect preference (Wohlwill, 1982).

Coastal development’s compatibility with its setting is clearly related to its meaning. Wohlwill (1978, 1982) notes that a building’s function and the character of the coastal setting affect viewers’ perceptions of contrast between building and setting. A resort may introduce less contrast than a lumber mill in a natural setting. In a developed setting, a building may introduce less contrast than in a natural setting. Historic meaning may also make a structure compatible with its setting (Lowenthal, 1962).

The vast scale of views to coastal waters also affects their compatibility. Platforms can be relatively insignificant in comparison with the scale of their setting. The distance from shore to platforms may also decrease their visual effect. But even those platforms that are within three Miles of shore may be visually subordinate to the panoramic expanse of coastal views. The natural appearance of coastal waters dominates by its scale (Mackey, 1982).

Development may be attractive when it introduces some level of contrast to its setting. Wohlwill’s studies indicate that while contrast is related to preference, minimizing contrast may not maximize preference. A moderate level of contrast between development and setting may be most highly preferred.

Different answers to the question of how much contrast is best lead to conflicting management policies. If any type of development in a heretofore pristine coastal area is seen as creating negative visual effects, it makes sense to support additional development only in those areas where development exists (Baird et al., 1979). A policy of blending new development with old explains the Washington State Environmental Policy and the Shoreline Management Act, which encourage clustering development in already developed areas (Blair et al., 1982). Similarly, the 1975 California Coastal Zone Conservation Commission Guidelines
specify that development should be sited near other vertical features, natural or built, to minimize contrast (Wohlwill, 1982).

If, however, some level of contrast is seen as enhancing visual quality, policies supporting more widespread siting of development and more widespread monitoring of visual quality make sense. Such policies would recognize that some undeveloped landscapes would become more visually interesting with development. They also would recognize that some developed landscapes are of high visual quality and need management to maintain that quality.

**Ephemeral Characteristics**

Weather and diurnal changes create ephemeral landscape characteristics that can almost entirely change landscape views. Landscape elements like boats, people, animals, and sealife are also ephemeral characteristics. They may provide interest in an otherwise bland scene. They also may be clues to the use and meaning of the landscape. All of these are likely to affect preference.

Some ephemeral characteristics are not easily mapped or managed, but their presence and effect should be recognized. Others can be managed. For instance, night lighting in landscape views must be assessed according to a Seattle city ordinance (Blair et al., 1982). Management of ephemeral characteristics could go much further. Night lighting might be designed to take full advantage of its attractive focal effect, for example.

**Tidiness**

Tidiness is a manageable ephemeral characteristic of special importance. A coastal landscape that looks orderly and neat is likely to be preferred over others. As Lowenthal (1962) points out, litter is disliked not only because it disrupts the visual harmony of a view but also because of what it means. Where industrial areas are well maintained, viewers may read a broader care for the environment.

Oil and gas facilities generate considerable debris including structures that are no longer used (Armstrong and Ryner, 1978). Viewer perception of these facilities is likely to be influenced by their maintenance as well as the disposal of debris.
Data Gathering

The four general landscape characteristics above were studied in 393 views of the Grand Isle, Louisiana, Gulf Coast area. These views were the subjects of the study. They were selected and described by visitors to and residents of the area in interviews conducted on Grand Isle. Interview subjects described features of each view and also rated the attractiveness of each view.

Study Area

Grand Isle, Louisiana (Figure 1) is a barrier island which has been the site of mineral-related development for over thirty years. Oil, gas, and sulphur platforms are visible at distances ranging from three miles. The small, flat island, 7-1/2 miles long, accommodates highly varying land uses. Along with onshore facilities for the mineral extraction industries, the island is the site of docks and seafood processing facilities, small resorts, vacation homes, a state park, and a residential community of 2000.

The island is set in a classic low-relief coastal environment. It includes few trees, straight sand beaches facing the Gulf, and sheltered marshes and bays on the inland side of the island. Along with the island itself, these inland areas are sites of onshore oil and gas development.

Interviews

Forty interview subjects were selected to represent visitors to and residents of the island, people who were and were not directly employed in fields related to either coastal development or resource planning, and men and women. Twenty-six were full-time residents, two were part-time residents, and twelve were visitors.

That the residents of the island, many of whom had lived there most of their lives, dominated the interview sample must be considered in interpreting research results. Many of the interview subjects may have adapted over time to the appearance of development in the area. On the one hand, this makes analogies between their preferences and those of residents of undeveloped areas questionable. On the other, it suggests how development might affect viewer preference over the long term.
Figure 1. Interview site: Grand Isle, Louisiana.
In open-ended face-to-face interviews with standardized questions and format, subjects were asked to identify and describe attractive and unattractive Grand Isle views of several land-use types. They rated each view on a 10-point scale defined by the most and the least attractive views in the area. Finally, they described features of the views. Twelve of the 40 interviews were shortened to include only the most and least attractive views in the area and oil and gas related views.

Data Analysis

The 393 views, representing 206 locations, were the subjects of analysis. View descriptions and attractiveness ratings had been recorded for all of the views. Two kinds of information were used in the analysis described here: 1) the presence of landscape features in the views as described by the interview subjects, and 2) viewer preference as determined by the subjects’ rating of the attractiveness of each landscape view.

A factor analysis of feature presence classifications indicated what landscape features tended to appear together in landscape views. Twenty-six factors or area viewtypes were derived (Table 1). The relationship of landscape features to the factors is shown by the factor loadings—the larger the absolute value, the stronger the relationship.

The 26 factors were then used in the second analysis, a regression of the factors or viewtypes on view ratings. Factors were entered into the regression equation in a stepwise procedure, in order of their importance for reducing the variance in view ratings. Together the 26 factors accounted for 44.4 percent of the variance (Table 2).

Results and Discussion

Apparent Naturalness

Apparent naturalness, as reflected by the factors, strongly influenced preference. Naturalness was clearly noted in the description of landscape features and favored in ratings of landscape views.
Of the 26 factors, three (Factors 3, 11, and 26) described natural-appearing landscapes without development. All of these had positive relationships with preference, and all were significant ($p \leq .05$) in the regression equation. Together they accounted for 6.0 percent of the variance in view ratings.

Some of the factors that described development had significant negative relationships with preference. These tended to describe highly visible development that was near natural-appearing areas: roads and canals in the marsh (Factor 24), and onshore oil and gas facilities (Factor 21). They accounted for 3.9 percent of the variance in view ratings.

Developed landscapes were not all disliked. Many factors including development had no significant relationship with preference; ratings of views associated with these factors varied widely. A number of other factors including development had significant positive relationships with preference.

**Compatibility of Development with Its Setting**

These positive relationships were probably caused partly by the compatibility of development with its setting. Interview subjects' descriptions of landscape features suggested that development was compatible when it had historic or recreational meaning (as in Factor 4, the historic fort that was a regional landmark, and Factor 8, the marina), when it was distant from the viewer (as in Factor 14, the view back to the developed island from offshore), or when it was proportionately small in comparison with the visual scope of its setting.

This interpretation is supported by the strong positive weights of factors in which development was dominated by its setting: Factor 6, the Gulf with development; Factor 9, the tree grove with well-maintained homes; and Factor 2, the platforms at night. Factor 19, a footpath through an undeveloped area; Factor 5, the marsh with development; and Factor 13, the Gulf at night, also described viewtypes in which development was subordinate. Although these factors clearly are affected by other landscape char-
acteristics as well, they all portray development that might be judged to be compatible from some viewpoints (Figure 2). Together they account for 17.1 percent of the variance in view ratings.

Overall, the relationship between preference and factors with compatible development supports Wohlwill's assertion that some contrast between development and its setting may be attractive. It also supports a design-oriented rather than prohibitive approach to coastal visual management. Keeping undeveloped areas undeveloped while increasing the density of existing development may not be an appropriate management policy in some cases. Instead, both types of areas can be managed to create a visual balance between development and the landscape setting.

The four compatibility factors with the strongest relationships to preference strongly suggest that other landscape characteristics contribute to compatibility. Boats and a platform with a long horizontal configuration in Factor 6; well-maintained homes in Factor 9; a historic landmark in Factor 4; and the lights of platforms at night in Factor 2—these viewtypes not only demonstrate the potential value of variety in natural settings, they also suggest that historic meaning (Lowenthal, 1962) and ephemeral characteristics are related to compatibility.

Ephemeral Characteristics

Ephemeral characteristics were important to predicting preference. Tidiness, the most important of the changing landscape characteristics, is described below. Night viewing also had a strong effect, while the effect of people, animals, or vehicles was less pronounced.

Night views simplify the landscape, and can make lighted development attractive. Lighted platforms were strong focal elements in the dark view out to the Gulf (Factors 2 and 13). Viewed from the Gulf, the lights of onshore development were also seen as attractive (Factor 14). Stars and the moon (Factors 1 and 13) were also remarkable to interview subjects. Together these factors accounted for 5.0 percent of the variance in view ratings.
Figure 2. Onshore oil and gas facility set in the marsh. (Photograph Linda Mackey)
The attractiveness of factors including nighttime lights, especially artificial lights, suggests that night lighting could be a design element in coastal development. Along with prohibitions against intrusive lighting could come incentives for developing the design potential of lighting.

The activities of people, animals, or vehicles seemed to be accessories to landscape views. They were included in many factors but dominated few. Other landscape features were more consistently described. Two factors in which these ephemeral characteristics did dominate (Factor 15, describing activity of fish and sealife, and Factor 17, describing activity related to mineral extraction) were not significant predictors of preference. The absence of people was an important feature of Factor 11, the natural beach, which was a significant predictor.

Overall, these characteristics tended to be noticed in but not fundamental to Grand Isle views. In another environment where activity-related characteristics would be part of predictable cyclic events they might have been more important to understanding preference.

**Tidiness**

Tidiness of the landscape was the most important ephemeral characteristic for predicting preference. One indication of its importance is the frequency with which distinctions were made. Interview subjects described three kinds of vacation homes—vacation homes in general, unkept vacation homes, and well-maintained vacation homes. Similar distinctions were made among beaches, homes, yards, and commercial buildings. In addition, the presence or absence of trash was described for very many views. Some subjects mentioned erosion of the beach as a further sign of untidiness.

Untidiness had a strong negative relationship with preference. Factor 18, trash and litter, combined many of the features describing a lack of tidiness. Of all the factors, it was the most important predictor of preference. The next factor in importance was also related to tidiness. Factor 7 described the bayou with derelict structures. Poorly maintained urban development (Factor 25) was
another important predictor. These accounted for 14.7 percent of the variance in view ratings.

Tidiness probably also accounted for some of the difference between Factor 9, well-maintained homes in a tree grove, and Factor 16, general residential development, in their relationships to preference. Factor 9 was a strong positive predictor while Factor 16 was a strong negative predictor. Maintenance was one of the obvious differences between the two factors.

Landscape maintenance and disposal of litter and debris clearly affect preference. Viewers may appreciate the visual order of a tidy landscape. They may also assume that a landscape that looks neat is clean and well-managed in unseen ways as well. Where oil and gas facilities are tidy, they may be without some of the negative connotations of heavy industry. Where they are untidy or where adjacent areas are visibly disturbed by their debris, they confirm stereotypes of industry as despoiler of the environment.

Both maintenance and disposal could be addressed by visual management policies. Developing and evaluating plans for these activities would be straightforward. The novel aspect of tidiness as a visual management characteristic is recognizing its importance.

**Conclusions**

The results of this study suggest that some aspects of a coastal visual management policy might be quite different from policies adapted thus far for inland visual management. Though there is no statistical basis for generalizing these results to coastal landscapes beyond the Grand Isle area, ideas supported by this study might be validly applied to similar landscapes.

The study reaffirms that apparent naturalness is central in predicting preference. But it suggests that while undisturbed natural-appearing landscapes have intrinsic appeal, some developed landscapes have equal attractiveness. Where development is compatible with its setting, it may add to landscape attractiveness or at least not detract.

The desirability of blending new development with the existing landscape has dominated visual management policy. In some
cases, coastal development that blends with the landscape maintains attractive views. The near invisibility of platforms distant from shore is a case in point.

In other cases, coastal development will enhance preference when it provides a counterpoint to the dominant natural setting. Nighttime views, in which the lights of development are focal, demonstrate this with particular clarity. Preference for daytime views, in which development at a middle distance contrasts with but is subordinate to its setting, further supports this idea. Development increases the attractiveness of some landscapes. Careful design could enhance this possibility for coastal development.

Tidiness could also be managed to increase preference. This includes practices from removing litter to disposing of abandoned equipment, painting buildings, and clipping grass. The orderliness of a tidy landscape may have immediate visual appeal. Equally important, tidy landscapes express their caretakers’ concern. A maintenance plan may be as important as a design scheme in evaluating the visual impact of coastal development.

The design and siting of oil and gas facilities may greatly influence their visual effect. Where care is taken to use design and maintenance ideas that enhance viewer preference, oil and gas facilities can become acceptable elements in the coastal landscape. That care, expressed from the earliest stages of oil and gas exploration, has been a crucial missing element in much planning for coastal development.

References


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